The Margin and the Mainstream:
Positioning Harry Partch's Theories
within the Broader Discourse of Musical Aesthetics

by

Derek Gripper

Supervised by Dr. Hendrik Hofmeyr

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Abstract

The dissertation examines the broader musical value of microtonal composer Harry Partch's musical theories by locating his critique of abstract music within mainstream compositional theory and aesthetics. This contextualisation aims to deconstruct Partch's iconoclastic image so as to understand his contribution within a wider realm of critical discourse.

The work of composers that follow in Partch's footsteps becomes important in this context, especially that of his one-time student Ben Johnston whose own microtonal aesthetic is firmly rooted in European aesthetics from Debussy to Schoenberg. By a study of Johnston's utilisation of Partch's theory of just intonation the dissertation attempts to arrive at a more inclusive compositional theory, one which continues to address those aspects of Partch's theories that serve as a valid and constructive critique of traditional musical values.

Taking Adorno's view that musical critique must deal with the problem of reification at the level of musical materials, the author proposes a reading of Partch's corporeal philosophy that is applicable beyond the confines of narrative musical drama. By creating a distinction between historical models of organisation and 'second nature' forms of musical presentation, it is suggested that critique does not necessarily prefigure alienation from the mainstream, but can rather be situated within musical discourse in such a way that a new image of the latter's forms results.

On a practical level, the dissertation explores the validity of expanded just intonation as a means of achieving this immanent critique, both in the realm of compositional theory and, implicitly, in that of analytical theory, concluding with the description of a tuning system with the capacity to synthesise the range of compositional theories explored.

Contents

Preface

By understanding musical organisations such as harmonic tonality as distinct psychoacoustical modes – i.e. musical organisation as a characteristic of human consciousness - the American composer Ben Johnston suggests a new means of integrating musical parameters. This viewpoint arose out of the adoption of a harmonically organised music expanded beyond the arbitrary boundaries of twelve-tone equal temperament. Johnston's microtonal compositional language, first evident in works of the early sixties such as *Knocking Piece*, the Sonata for Microtonal Piano and the Second String Quartet, was formulated more than ten years after a sixth-month study period with pioneer microtonalist Harry Partch. While Johnston's early compositional language is rooted in serial music, his music from the sixties onward has attempted to address the problem of unintelligibility in serialism, without denying the necessity for an avant-garde art, an art that has the potential to critically engage with the present:

> The seemingly parallel course of writing music in styles and idioms used in earlier music produces an acceptance based too much upon a nostalgia for the past of music and a misperception of the way in which the arts can illuminate the way we live. [...] If music of the twentieth century does not reflect the degree to which life is greatly different from life in the nineteenth or the eighteenth century [...] then it is in an important sense escapist, as is the conventional programming of the music of the past.[1]

Johnston is, furthermore, aware of the need for art to be critical of its own forms:

> We already face a situation in [American] culture where the values of 'serious music' are threatened economically as well as culturally. If we elect to preserve only the museum aspects of this tradition because of the anachronistic social and economic organisation of the main channels of dissemination, we will ensure its atrophy.[2]

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[1] Johnston, "Extended Just Intonation: A Position Paper," 518.
[2] Johnston, "Beyond Harry Partch," 229.

The greatest challenge for an avant-garde artwork is the difficulty of rendering the 'new' while simultaneously remaining intelligible. "Intelligibility" in musical works is linked to what Schoenberg referred to as 'comprehensibility' or musical unity [3] In his lectures on "The Path to the New Music" Anton Webern said:

Comprehensibility is the highest law of all. Unity must be there. There must be a means of ensuring it.[4]

Along with the disappearance of the shared social norm of tonality[5] comes a challenge to the relationship between the individual and the community. As Adorno wrote in 1926:

The difficulty and exclusivity of Webern's works stem from the fact of the relation between prescribed form and personal freedom having been broken, since we accord the right to the individual to choose his forms; while musical comprehension is normally supplemented by a tension existing between the community and the individual [6]

Today it is evident that this relationship cannot disregard the more general problem of musical materials In Western music from c.1600-1900 intelligibility was built into the communal nature of 'tonal' musical materials, the prescribed forms of harmonic and polyphonic music. Arnold Schoenberg was probably the first musician to unequivocally characterise tonality as a 'second nature'[7] form rather than a direct expression of physical laws Schoenberg wrote in his 1911 *Theory of Harmony* that:

our present-day ear has been educated not only by the conditions nature imposed on it, but also by those produced by the system, which has become second nature [8]

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[3] The German "Zusammenhang" (Unity) implies connections, relationships between entities or parts of the same entity, and also "relatedness," cohesion or unity. (Leo Black's preface to *The Path to the New Music* by Anton Webern)
[4] Webern, *Path*, 43.
[5] Schoenberg writes: "We can assume that tonality is a function of the fundamental tone (tonic); that is, everything that makes up tonality emanates from that tone and refers back to it But, even though it does refer back, that which emanates from the tone has a life of its own – within certain limits, it is dependent, but to a certain degree also independent " (Schoenberg, *Harmony*, 150.)
[6] Adorno, "Anton Webern" in Friedrich Wildgans, 166.
Second nature is an "artificial cultural product." (Paddison, *Adorno*, 72.)
[8] Schoenberg, *Harmony*, 48.

The difficulty of resolving the conflict between the intelligible nature – and therefore expressive potential - of these second nature forms, and the artistic importance of works revealing "the chasms in truisms,"[9] will form a dominant concern of the following study The New Viennese School proposed the death of tonality in its old form, Webern for example, stating that there was "no point in going on dealing with something dead."[10] The following will take a contrasting view by looking at the artistic value of unlocking the broader significance of second nature forms such as those embodied in pre-serial music. This is achieved by understanding them in their capacity to act as ciphers for more general phenomena, with general reference outside of specific manifestations or systemic limitations. In themselves and untouched, historical customs reveal little but narrative interest to the creative present, yet it will be argued that the restoration of the interior meaning of these community-based objects is fundamental to the creation of a socially relevant avant-garde art. Thus "dealing with something dead" takes on a new critical significance.

A study of abstracted musical materials must focus on factors of musical composition that occur outside time, before the composition of an actual work Where conventional musical analysis looks at the individual utterance or composition, employing criterion defined by the 'given' norms of an applicable second nature, 'outside time' analysis attempts to decipher the signs within a total musical language. This abstracted language is understood as constituting an object in its own right, albeit one which is both illusive and elusive. This study will suggest that the location of the aforementioned tension between community and individual occurs at the level of this abstract musical material and as a result of its internal inconsistency, which Ayrey refers to as its "creative aporia."[11] It will be proposed that the revelation of the contradictory nature of musical materials has the potential to prevent their anachronistic ossification or reification.

[9] Webern, *Path*, 10.
[10] Ibid. 47.
[11] Ayrey, "Different Trains," 6.

Theoretical Conceptions of 'Nature'

The terminology of music theory has frequently evoked the concept of 'Nature' and 'the natural' as a realm of the 'given.' This is understood as a realm occurring before and above human agency, a realm of the 'factual,' existing prior to action, which is usually represented in the signs and language of the natural sciences. These sciences afford a means of semiological representation of the phenomenological aspects of music, namely musical materials such as pitches and their relations, which provides a rigorous musical theory as a basis for the more creative activity of musical composition

Locating the exact dividing line between what is natural and what is constructed by human action is, however, somewhat problematic. Lukács' definition of reification sheds a significant light on this problematic of 'the natural.' For Lukács 'Nature,' becomes rather a name for that which we have forgotten. When historic conventions or - to use the term used by both Lukács and Schoenberg – 'second nature' forms become subsumed or refied as an aspect of a popular and uncontested consciousness, they appear to take on an autonomous reality, independent of their roots in history.

This rational objectification conceals above all the immediate – qualitative and material – character of things as things. When use-values appear universally as commodities they acquire a new objectivity, a new substantiality...which destroys their original and authentic substantiality [12]

Music theorists have, in the past, frequently used this technique of forgetfulness as a basis of their theories, coupled with a diversion made possible by the compartmentalisation of theoretical labour. We see in the tradition of physicalism[13] extending back to Rameau, a marked tendency towards dogmatic facticity relying on the incontrovertible data of other areas of specialisation. The primary aim of theorists such as Rameau, and later, Riemann, is to base a theory of tonality on "acoustical fact."[14] Riemann maintained that "the task of

[12] Lukács, *History and Class Consciousness*, 92.
[13] Physicalism. "The view that everything that is real is, in some sense, really physical." As used in the philosophy of science, physicalism is the view that all factual knowledge can be formulated as a statement about physical objects and activities." (http://www.artsci.wustl.edu/~philos/Mind Dict/physicalism.html)
[14] Dahlhaus, *Harmonic*, 7

a theory of art [is to] fathom the selfsame natural lawfulness that consciously or unconsciously rules the creation of art and set it forth in a system of logically coherent theorems,"[15] while "the proper goal of historical research is to reveal the ultimate natural laws, common to all periods, that control all perception of artistic forms."[16] For Rameau, a similarly physicalist theory of musical materials provided a means of getting to grips with the intricacies of the materials of compositional practice during his day. The objectification of musical materials, achieved by ignoring the dependency of pseudo-scientific theories on their own questionable parentage, serves as a means of artistic valuation:

> if through the exposition of an evident principle, from which we then draw just and certain conclusions, we can show that our music has attained the last degree of perfection and that the ancients were far from this perfection [...], we shall know where we stand.[17]

Rameau required the art of composition to rest on a firm foundation of factual knowledge, provided by rigid laws of 'Nature,' presenting a craft of composition that sought to unlock the full potential of available musical sounds by a scientific analysis of the acoustical properties of musical tones.[18]

> They seek refuge in the methods of natural science, in the way in which science distills 'pure' facts and places them in the relevant contexts by means of observation, abstraction and experiment.[19]

Theories that defer authority to other realms of enquiry achieve a dogmatic positivism, because to question the grounds of one realm requires the questioning of another, a

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[15] Ibid. 12.
[16] Ibid. 59
[17] Rameau, *Treatise*, xxxiii.
[18] Rameau's description of the octave provides a means of governing the laws of intervals. Because of a hierarchy of tones, where the minor third and the perfect fourth are understood to result from a 'second term' which is the octave, these intervals are subsumed under the general principle of chordal inversion. They are therefore further expressions of the *perfect chord* and are influenced by almost identical compositional procedures. This similar function relies on the fundamental bass whose existence depends on the principle of chordal inversion. In this way C-E-G and E-G-C both rest on the assumption of a fundamental bass of C which will determine the correct chordal succession for both chords.
[19] Lukács, *History and Class Consciousness*, 5.

question which would merely elicit "a third miraculous animal,"[20] i.e. a third supra descriptive realm. Specialist disciplines obscure musical theory from the "image of the whole,"[21] while, as Lukács rightly points out, "rationalisation is unthinkable without specialisation."[22]

This rationalisation of the world appears to be complete, it seems to penetrate the very depths of man's physical and psychic nature. It is limited, however, by its own formalism. That is to say, the rationalisation of isolated aspects of life results in the creation of – formal – laws. All these things do join together into what seems to the superficial observer to constitute a unified system of general 'laws.' But the disregard of the concrete aspects of the subject matter of these laws, upon which disregard their authority as laws is based, makes itself felt in the incoherence of the system in fact. This incoherence becomes particularly egregious in periods of crisis. At such times we see how the immediate continuity between two partial systems is disrupted and their independence from adventitious connection with each other is suddenly forced into the consciousness of everyone.[23]

Harry Partch's model of pitch space,[24] represented by what he calls the Tonality Diamond, falls well inside the above tradition of physicalism. Partch's focus differs slightly from Rameau's in that he bases his theory on the physiology of the subject rather than the physics of an external or 'natural' world. Partch shares with Riemann the influence of Helmholtz whose analysis of the human ear in *On the Sensation of Tone* provides Partch with a physiological model of musical pitch represented by rational vibrational quantities. This shift from the external physical world to internal physical constitution brings the 'natural' into the realm of a kind of universal subjectivity, defined by the physical apparatus through which we perceive the world. The basis of Partch's theory is informed by his belief that musical tones always imply some relation with one another. This, he writes, is

[20] Ibid. 110.
[21] Ibid. 103
[22] Ibid. 88. Lukács quotes Marx's *Capital*
[23] Ibid. 101.
[24] See Addendum 1.

because the tiny bony snail inside the human head, with its longitudinal partition, with some twenty-three thousand fibres stretching across it, and with at least twelve times twenty-three thousand tiny hair cilia to pick up the smallest displacement of air and send that sensation via nerve conduits to the brain, make it a relation... The ear informs us that tones which are in small-number proportion, say in the relation of 2 to 1, are strong, clear, powerful, consonant [a sensation] different from the sensation created by a large-number proportion of, say, 23 to 20, which to the ear may be strident, confused, discordant.[25]

Compare this to Rameau's approach:

The order of origin and perfection of...consonances is determined by the order of... numbers. Thus the octave between 1 and 2, which is generated first, is more perfect than the fifth between 2 and 3. Less perfect again is the fourth between 3 and 4, etc: always following the natural progression of the numbers. .[26]

It is interesting to note, especially in light of Partch's highly individualist aesthetic stance which will be discussed later, that Partch's *material* theory sacrifices individual subjectivity in favour of claims to objective universality, provided by rigid scientific laws. It will be seen furthermore that the rigidity of his compositional theory remains inconsistent with the ontological status of the composer as presented by his aesthetic philosophy. A materialist viewpoint of aesthetics, which takes the relationships between compositional forms and their history as having paramount significance to the content of the utterance, must, in contrast to Partch's programme, formulate an aesthetic theory that remains consistent and inextricably linked to the materials of music-making themselves. Within a materialist framework it is not, therefore, possible to relegate creative subjectivity to a specialised realm of musical activity – composition – while posing a kind of static objectivity in the realm of abstract theory.

It will be proposed here that a theory taking into account some view of the whole can only result by eradication of the distinction between analytical or objective theory on the

[25] Partch, *Genesis*, 86.
[26] Rameau, *Treatise*, 6

one hand, and subjective creativity in compositional theory on the other. Both must take into account the fragmentation that each proposes in isolation. Both must therefore operate on similar ontological grounds. Within the context of Harry Partch's aesthetics this must be one of individual subjectivity espoused in his "corporeal" artform. Thus the necessity to locate the corporeal aspects of abstract theory arises, and with it the need to locate the corporeal qualities of the musical language as they stand apart from second nature representation. The latter must always exist as a high degree of social abstraction and specialisation, leading once again to "the destruction of every image of the whole."[27]

Physicalist or objective theoretical viewpoints agree in that they attempt to reduce the unknown into the code of the known,[28] while proposing a programme of disinterested explanation. They achieve the latter by "forgetting" the social origins of the known, and therefore allowing the facts of history – in this case of scientific history – to dictate the laws of the new theory. The delineation of the 'natural laws' embodying the 'known' on the one hand, from what Fétis called "metaphysical law"[29] or socio/historical facts on the other, is therefore a primary *creative* task for the music theorist seeking to base a theory on factual data. It becomes evident, however, within the larger picture, that the explanatory and scientific style of these theories seek to conceal the contingent nature of this creative act, frequently appealing to that which lies outside the object under investigation, to a "protection, a prop, an established authority."[30] This "kind of confidence trick"[31] is a justification of individual praxis by historic and naturalistic authority amounting to a concealment of the creative basis of action behind a juggling of authoritative roles. These provide the self-effacing veil of 'objective fact'[32] as justification for general musical praxis.[33]

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[27] Lukács. *History and Class Consciousness*. 103.
[28] Adorno. *Aesthetic Theory*. 59.
[29] Dahlhaus. *Harmonic*. 14.
[30] Nietzsche. *Genealogy*. 102.
[31] Boulez. *Orientations*. 42.
[32] Sartre writes that "fact" is separate from everything else and is therefore non-significant. "the human reality is not a sum of facts." To signify, for Sartre, is to indicate something else, and in this process one finds the thing signified. (Sartre. *Sketch*. 27)
[33] The tendency to conceal interpretative contingency under a veil of factual data is clearly a central issue in the performance of early music. Contemporary ideas on the philosophy of 'correct' performance of early music rely on two fundamentally illusive Concepts: interpretation and authenticity. Joshua Rifkin claims that interpretation as a description of the act of musical reproduction was essentially foreign to early music-

Such arguments are still prevalent today in the circles espousing 'just intonation' as a necessary acoustical, psychological or historical musical basis. On this topic microtonal composer Julia Werntz writes:

The fact that theories quantifying consonance and dissonance have always changed, from Pythagorus and Aristoxenus to the present, belies the notion that one can objectively interpret acoustical fact and apply ones finding once and for all to music theory.[34]

Here Werntz rightly questions the epistemological difficulties inherent in the attempt to base a music on what Ben Johnston has called, "the real scientific nature of sound."[35]

making. ([Rifkin "Reinventing the Wheels" *Early Music*, 379.) Due to many considerations, not least of which were the limited rehearsal times – often only one play-through – music-making was more often a case of a "reading" than a conscious attempt at interpreting deeper musical content. (Ibid. 379) According to Peter Kivy, authenticity has become a modern synonym for a 'good' interpretation. (Kivy, *Authenticities*, 108.) even though the question of whether or not the evaluation of an interpretation by its relative authenticity is "self-justifying" remains unclear. (Ibid. 2.) In fact the appeal to authenticity frequently conceals a dogmatic approach to musical interpretation, once again by an appeal to factual data. The performance of early music frequently relies more on the intentional state of current aesthetics, than the so-called facts surrounding an early work.

[34] Werntz, "Adding Pitches." 167

[35] Lantner, "An Interview with Ben Johnston." 2.

Reification and Critique

In *The Theory of the Novel* Lukács developed the concept of 'reification' to express the process whereby cultural property such as language, beliefs or artistic forms, are emptied of their original content and invested with new meanings. Rather than being a new discovery or a further exploration into the deeper material significance of this property, a reified interpretation is an abstract one, one which is at an increasing remove from its individual reality. This abstraction is the result of the interests of an alien framework, which cannot take the reality of the object into account without doing damage to itself. The new focus is thus on the use-value of these objects within a society with interests entirely independent of the object's original and material form.

The process of reification occurs when the social roots of historical forms are forgotten or 'naturalised' and their contingent nature is decayed. Thus the dependence of these forms on the co-ordinates of a material reality is ignored, while an autonomous – illusory – image is constructed in the image of a new reality. These naturalised phenomena take on an autonomous status by becoming definitive landmarks on the new social plane. In physicalist musical theory, this absolutised status is justified as the expression of 'natural laws,' while the fact that this status is in actual fact one of second nature, rather a cultural *interpretation* of natural phenomena, is concealed. The continuous appeal to external authority for the purpose of an ahistorical theoretical justification of history, can be seen therefore as a *deus ex machina* that has value only as concealment of the subjective contingency of theory behind a veil of objective 'fact.' Outside of theoretical activity, a similar veil is lowered, in the realm of musical reception itself, when art attaches itself to the mitigation of what Nietzche refers to as the "illusion of culture."[36] Non-illusory engagement with historical artifacts takes place through a similarly non-illusory engagement with the present. And it is when the incongruencies of the present are *accepted*, that this relationship with history comes about. In this sense 'natural truths' are not only a documentation of past acts, but are also a document for and of the present

[36] Nietzsche, *Birth of Tragedy*, 63

Adorno's aesthetics relies on Lukács' concept of reification, the importance of exposing the false consciousness implicit in the act of attributing truth to a reified world. To mis(re)present an historical musical work, for example, encourages ossified interpretations both on the part of the audience and the performer, which in turn encourage a reified view of the relationship between culture and history. A true engagement with history can yield a culture of the present, whereas a deferral to a rigid and timeless *image* of the 'culture' of history cannot. The relation of Beethoven's works to the nature of their own materials is thus completely different today to their state at the time of composition. This process is irreversible. It is irreversible because the material content of Beethoven's works is constantly under siege; always under the pressure of the new, which is the context by which interpretation must take place. It follows that a performance that does not seek to illuminate this process attempts only to access the socially reified phenomenon rather than the truth content of the work itself. This content must be seen within the context of the work's historical reality, as it stands in relation to the here and now.[37]

Adorno's view epitomises a critical as well as a materialistic concept of modernity, where Beethoven's particular artistic contribution is seen to reside in the critical nature of his musical materials. Within the context of eighteenth-century tonality, Beethoven's tonal language represents a significant glance towards the implicitly ambiguous nature of tonal relationships. Diatonic tonality remains the primary point of reference, but the intentionality of these structural relationships is rendered more ambiguous than in the works of his predecessors. Furthermore, the structural significance of melodic ideas is increased, which weakens the syntactical importance of the tonal hierarchy still further.[38] But encountered from the viewpoint of the twentieth-century listener, in light of the dissolution of tonality, as well as the complete chromatisisation of harmony in the late

[37] "As Adorno wisely said, there is more tradition in the Bagatelles of Webern's Opus. 9 than, for instance, in Prokofiev's Classical Symphony [...] reproducing a model from the past is meaningless" (Boulez, *Orientations*, 39.) This statement holds true for reproducing models of works from the past without critical mediation by the present.

[38] The structural role of the motif can be seen to have led the way towards twelve-tone composition, to the "production of coherence through the use of a unifying succession of tones which should function at least like a motif. Thus the organisational efficiency of the harmony should be replaced." (Schoenberg in *Schoenberg Letters*, 248.)

nineteenth century, the *cantabile* of Beethoven's style - its merest physiognomy[39] - becomes its most characteristic feature. Beethoven's progressive approach to eighteenth-century tonal norms, which from an historical viewpoint finds an analogue in the innovation of those of the twentieth century, is forgotten when his music becomes ossified as the 'Beethovian style', the accepted phenomenon of 'Beethoven.' This view is further compounded by the standardisations of the concert hall and other cultural trappings: required dress, appropriate behaviour, the authority of historical accuracy, as well as the sanctioned authority of genius. These extras all serve to place Beethoven firmly within social life as ossified 'culture.' These aspects of the engagement with the artwork now form the most important features of an aesthetic practice which relates only to abstract relationships between members of society without taking into account the physical reality of the artwork. Things are no longer encountered as things, but are converted into the reified image of the social totality. Lukács reminds us that

[reification] requires that a society should learn to satisfy all its needs in terms of commodity exchange.[40]

The result is that that society satisfies its needs in terms of its own abstract reference points, while alienated from concrete reality. It is this situation which Adorno has in mind when he writes of the refusal to engage with the reality and social content of artworks.

The masses want the shameful difference separating art from their lives eliminated, because if art were to have any real effect on them it would be that of instilling a sense of loathing.[41]

As audiences forget that Beethoven was not always so objectified and accepted a commodity, they find in his work justification to enforce the tendency to static views of present culture and its forms of expression. If Beethoven's work is accepted as 'culture' and 'high' art, and yet passes through the listener without the slightest difficulty or effort,

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[39] Paddison writes that "Social trends themselves have been reflected and expressed in the sound-material far beyond the unchanging physical facts and also far beyond a merely romantic espressivo." (Paddison, *Adorno*, 77)

[40] Lukács, *History and Class Consciousness*, 91.

[41] Adorno, *Aesthetic Theory*, 25.

then it becomes accepted that a similar level of engagement be required of the new culture, which due to its radical removal from Beethoven's reality, *must* require a complete reorganisation of his terms. Thus, by the creation of an ossified cultural artefact, a genuinely critical work of the past appears to take on an unquestionably affirmative role, validating the *current* status quo by rendering the regulative potential of both old and new forms impotent.

For Adorno this existence of artworks in a commodified form most extremely exemplifies the process of reification. This commodity character renders artworks "decomposed as a result of the triumph of their being-for-other."[42] In this case "being" is equated with social exchange-value rather than material or physical being outside of the social complicity. Commodification and objectification sacrifices the artwork's distance from the viewer by allowing it to embody a factual status in society. This results in a fundamental change in the experience of art, where the viewer becomes the definitive factor in the aesthetic mode. Art is forced into the realm of functionality, as a fetish with a functional significance that is entirely divorced from its content. A letter that Webern wrote to his cousin about Vienna concert life displays his awareness of the state of listening as a commodity:

> Now the high tide of the concert season flows with fearful strength. Too much! Too much! Every day there are at least three concerts [...] filled with people who applaud after every item. Whether it is good or bad, they don't care. Perhaps – no, certainly – the people can no longer tell the difference. As a result of too much, their attention, their ability to enjoy, is increasingly lessened, and as a result of the poor programmes and the 'magic arts' of the virtuosi their taste is spoilt for good. There is no ruthless criticism...supposing it goes on?[43]

The reified consciousness of the listener appropriates the artwork just as the objective scientific theory appropriates the artwork's phenomenological character. On encountering the artwork, the viewer as consumer creates a "stereotyped echo of himself,"[44]

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[42] Ibid. 23.
[43] Repoduced in Friedrich Wildgans' *Anton Webern*, 32.
[44] Adorno. *Aesthetic Theory*, 25.

reproducing the unknown artwork as a copy of known forms and experiences. It is here that we find the similarity to the theoretical programmes described above: the viewer no longer *interprets* a work in a true exchange, but rather replaces it with the factual status of another phenomenon. The content of the artwork is 'tamed' by replacing it with a stereotype. Lukács wrote that the basis of commodity-relations is

> that a relation between people takes on a character of a thing and thus acquires a 'phantom objectivity,' an autonomy that seems so strictly rational and all-embracing as to conceal every trace of its fundamental nature: the relation between people.[45]

Plato[46] was the first philosopher to measure art against its own use-value. The regrettable result of this deferral of art's interior meaning being that art becomes a hiding game, ashamed of its own sensual existence. Artworks and their theories become fated to continuously seek "a shadow world of 'meanings,'"[47] be this social exchange-value or scientific validation. In this respect art must be tamed by its own 'content,' a parallel equivalent which must control it. Whether 'content' is an external message, the expression of higher laws or the indication of its place in a social matrix, it serves only to draw the attention *away* from the artwork toward what, as shall be argued later, is often an arbitrary form of *presentation*. Such readings, posing as 'interpretation,' are what Sontag has called "the revenge of the intellect upon art."[48] Theoretical and artistic readings must, however, avoid this rationalised rage at the elusive nature of our social and scientific theories if they are to illuminate the value of these readings for a corporeal present. Theories that seek only to reduce phenomena under categories defined by factual data sacrifice the revealing nature of this theoretical inconsistency - its potential to dislodge the image of the fetish.

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[45] Lukács, *History and Class Consciousness*, 83.
[46] For Plato artistic mimesis (representation) was an imitation and therefore inferior to reality. (Routledge, 381.) "[T]he imitation of a phantom [...] belongs to a sphere still lower than the empirical world" (Nietzsche, *Tragedy*, 108.)
[47] Sontag, *Reader*, 99. Plato says of the prisoners in "The Simile of the Cave": "if they were able to talk to each other would they not assume that the shadows they saw were the real things...and so in every way they would believe that the shadows...were the whole truth." (Plato, *The Republic*, 317-318.)
[48] Sontag, *Reader*, 98.

Within the context outlined above one can see that to look to history to find the truth or authenticity of a musical work is in actual fact a denial of the potential impact of decayed form. Likewise, the attempt to ground a theory of music in the natural world is misleading in its denial of individual subjectivity and the interpretative nature of cultural viewpoints. An attempt to present historical forms as constant denies their mortality and encourages a misleading and 'false' consciousness that reinforces the process of reification. There must be a distinction between the relevance of disintegrated form on the one hand, and the claim of resurrection or objective explanation on the other, the latter being forms of false consciousness exemplified in purportedly disinterested or objective (re)presentation.

Adorno described modernist musical works as containing the image of a mediated totality,[49] in that they potentially represent a full picture of their own disintegration. To look at the present in terms of the products of disintegration is for Adorno a means of cleansing, of dissolving the contradictions inherent in our attempt to eradicate the 'spaces between' – the tensions – within each theory.[50] These spaces are documents of the non-identical relationship between material reality and objective explanation. The illumination implicit in these spaces is attainable each time a theory (be it musical or conceptual) performs an exegesis[51] of the nonidentical relationship between conceptual theories and their objects; every time a theory *confronts* the blind spot - or "creative aporia"[52] - which exists in any explanation. This critique is necessary if symbolic relations are not to be attributed to a material reality, the end result of which would be to alienate society still further from any reality outside of its own forms. Reified symbolic relationships therefore create a hermetically sealed society.

[49] Paddison sees a precursor to modernist art's closed world in *l'art-pour-l'art*, of the French Symbolists (Paddison, *Adorno*, 69.) Because of the loss of an outer totality (a homogenous world-view) art must "recreate totality independently within its own forms." (Paddison, *Adorno*, 32.) It is because of this situation that "[A]rt, the visionary reality of the world [...] has become independent: it is no longer a copy for all the models have gone: it is a created totality, for the natural unity of the metaphysical spheres has been destroyed forever." (Lukács, *Theory of the Novel*, 37.)

[50] Ayrey, "Different Trains," 6.

[51] What Nietzsche described as "the art of exegesis" requires in his own words "something which has been unlearned most thoroughly nowadays [...] something for which one has almost to be a cow and in any case *not* a 'modern man': *rumination*." (Nietzsche, *Genealogy*, 23.)

[52] Ayrey, *Different Trains*, 6.

Once the forms comprising an artwork become an accepted part of a social totality, they lose their power to refer beyond this totality and to operate outside of its arbitrary restrictions. The symbolic relationships between society and its artworks are achieved by consensus; they require the agreement or complicity of all parties involved.[53] But these symbolic relationships must be – and are - continually broken down and challenged by critical reflection; continually brought to a state of crisis. Foucault asserts that the very existence of power relationships depends on what he calls the "multiplicity of points of resistance,"[54] where the continual challenge of consensus gives way to new structures. Eco suggests that Barthes uses language as an allegory of general power relationships:

> the given language is power because it compels me to use already formulated stereotypes [...] that it is structured so fatally that, slaves inside it, we cannot free ourselves outside it, because outside the given language there is nothing.[55]

Barthes characterises language as a fatally self-referential system without the potential for self-critique. For Barthes literature functions as a point of resistance, a point of crisis in an otherwise unquestioned system of rules. Literature is therefore a "game of and with words"[56] where the possibility of escape is suggested by cheating[57] with the given system. To speak from within society is to speak using the rules, without hope of escape from Coetzee's 'prison,'[58] or Sartre's *huis clos*[59]. In comparison, the art of cheating provides momentary but elusive escape. Cheating functions as a critique of what Barthes believes to be the essentially fascist nature of language. He reminds us that "to *criticise*

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[53] Eco. *Faith*, 251.
[54] Foucault. *History of Sexuality*, 95-96
[55] Barthes quoted Ibid. 24.
[56] Ibid. 241.
[57] Cheating is notably evident in the works of composers such as Domenico Scarlatti in the guise of 'humour,' attesting to their modernity.
[58] J.M. Coetzee. "The Comedy of Point of View in Murphy" in *Doubling the Point*, 37. Wilhelm von Humboldt wrote in the 1830's: "Since experience and action depend upon man's representations, a man lives in relation to objects almost exclusively as language lends him to live. By the very act of spinning language out of himself, he spins himself into language. Thus the national linguistic community to which one belongs becomes a circle from which it is possible to escape only insofar as one steps into the circle of another language." (Coetzee. *Doubling*, 181.)
[59] Sartre's play translates as "No Exit."

means to *call into crisis*" – to "loosen the discourse" - and thus that critical interpretation is *a creative process that must equal the challenge of the artwork*.[60]

The technique of instigating crisis is a familiar aspect of modernist art, clearly evident in the writings of Kafka and the serialism of Schoenberg. Michel Tournier described a similar method:

It is not my aim to be formally innovative, but, on the contrary, to communicate, in a form which is as traditional, safe and reassuring as possible, a content which possesses none of these qualities.[61]

Eco's reading of Foucault is that the need to flee systems of power is the fundamental "incitement to discourse and production of knowledge," [62] that the need for escape has an essentially positive and productive function. Cheating contradicts the normal functionality of language usage and creates the need for critical discourse. To cheat is to continually confront the arbitrary nature of Lukács' 'second nature' and the arbitrary nature of signs,[63] forms that are sedimented within all cultural phenomena

For Adorno the modernist artwork's value similarly lies in its power to act as a social critique: when artworks call their own materials into crisis, they simultaneously criticise the social totality that originally sanctioned their existence The artwork and its (theoretical or musical) interpretations must therefore negate its own social function in order to call a reified social world into question. Because Modernism is a paradigm that can contain the negation of itself, it functions as a means of keeping social life alert to its tendency towards static safety. Because artistic fictions – which can be equated with musical systems, literary texts or even theoretical concepts - are closed systems, they are potential prisons. Consequently, the act of *explanation* – as distinct from interpretation - functions rather to the detriment of art by denying the artistic contingency of individual

[60] Quoted in Ayrey, "Different Trains," 4.
[61] Quoted in Peter Bürger, "The Disappearance of Meaning" in *Modernity and Identity*, 99
[62] Eco, *Faith*, 242.

[63] Saussure introduces this concept in *Structural Linguistics*.

creativity Critical interpretation is wholly at odds with scientific explanation, in that the object of the former is "to defend the creative aporia"[64] which is that aspect of theory that holds the image of its own non-identity Since this capacity to act as a regulator for the social phenomenon of reification must resist all attempts at explanation, it must remain consistently at odds with the social nature of explanatory signs.

[63] Avrey. "Different Trains." 6.

The Winding Sheet of Abstraction[65]

Harry Partch presents a material critique of fetishised musical signs, one that is levelled at the sanctioned cultural forms of abstract music. Abstract musical form epitomised for Partch the absurdity and meaninglessness of uncritically employing collective semiologies for the purpose of individual artistic expression. In this reaction he clearly defines his views on the critical importance of artworks as well as his strong belief in the possibility of autonomous and individual expression, outside of the terms defined by a reified world.

Partch's earliest microtonal compositions are for adapted viola and intoned voice. The viola, fitted with a longer neck, has twenty-nine monophonically generated pitches per octave marked out with lines and pinheads. This instrument, held between the knees for greater accuracy in stopping, aids the musician in the achievement of a more finely delineated tonal (pitch) 'fabric' than that of the standard twelve-tone (chromatic) scale. As a result there is, theoretically speaking, a far greater affinity with the fine pitch sense evident in everyday speech than is usually represented in melodies, significantly more even than deliberately verbal singing styles such as recitative or *Sprechgesang*. Partch's vocal writing in *Li Po* does not aim to be 'lyrical' or 'melodic' in the usual sense, his intent is rather to create a sound world with subtle gradations similar to the tonal inflections of speech. The work is an expression of Partch's "corporeal" philosophy of music, which he describes as "the essentially vocal and verbal music of the individual."[66] A corporeal music is a music of the physical present. It is the expression of an individual[67] intending to convey a singular experience, resulting from a single life that rejoices in the new.

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[65] Lawrence. *Phoenix*, 554.
[66] Partch. *Genesis*, 8.

[67] Ibid. 9

Partch saw 'abstract' or 'non-verbal' music, on the other hand, in terms reminiscent of Adorno and Lukács' critique of reification, as a

mass expression, in its highest application, the spirits of all united into one and transported into a realm of unreality, neither here nor now, but transcending both.[68]

His criticism is aimed at the non-individuality of serious music, which he saw as a mass production resulting from the standardisation of instruments and performing techniques. If a composer's music is forced to rely on the abilities of a performer or interpreter who may not be sympathetic to its particular standpoint, much of music's expressive content is lost. In Partch's viewpoint forms of mass realisation lead to meaningless mass expression, which forces art and its works into actions of internal mimesis or self-parody Music's frequent inability to reach beyond its own arbitrary physical reality as a style or genre – i.e. its own format - is sanctioned by the composer's reliance on instruments and notations that embody forgotten conceptual paradigms. On reading Partch's *Genesis of a Music* Ben Johnston reached the conclusion that "the very scale we were using had condemned contemporary composers to an ever-narrowing effort to exhaust the remaining possibilities in a closed system."[69] Unless a composer uses instruments designed specifically for a new music, represented by notations that allow the reformulation of organisational problems, it was Partch's belief that s/he must be content to tread old ground; to wrestle with materials that have lost their corporeal validity, and therefore their means to speak of and for themselves.

An entirely new path is thus necessary for the realisation of Partch's solution to the syntactical crisis evident in the music of the early twentieth century. As Partch wrote in a 1946 article called "Show Horses in the Concert Ring":

Some very drastic remedies are called for in order to bring vitality to a body of theory that rejects investigation and a physical poetry that excludes all but purely metaphysical poets. A period of

[68] Ibid. 8.
[69] Johnston. "Beyond Harry Partch." 225.

comparative anarchy, with each composer employing his own instrument or instruments, his own scale, his own forms is very necessary for a way out of this malaise.[70]

According to Partch's corporeal aesthetic, general meaning lies in language's relationship to events in the here and now of the individual's internal and external worlds. As a result, art's primary weapon against its own reified cultural status is to reinstate its own relevance to corporeal reality by extracting itself from its own internal crises and returning itself to the physical world, represented for Partch by the narrative form of musical drama. Partch values word-generated meaning over the message in abstracted, 'absolute' music, because the latter has become inextricably linked to the fetish quality of musical materials. Expression from within this arbitrary and highly contingent set of conventions is for Partch the ultimate exercise in absurdity, one which is particularly evident in the vehicles of abstract music, namely the orchestra and its vocal equivalent, the chorus:

[W]ith its words having the double noose of musical form and unison voices tightened around their necks, [the chorus] becomes ridiculous. Even a mob is made up of individuals, and mobs speak in unison only for 'art.' The chorus will cease to be ridiculous only when its sociological function is simplified ... [and it abandons] the effort to convey one message by the words of many.[71]

Partch's aesthetic goal is an intimate communication between the artist and spectator – a communication unmediated by the "fallacious standardisation"[72] necessary for large bodies of individuals to perform together, forming a paralysis of repetition. Partch's artist represents "the vital power of the [individual's] spoken word,"[73] a power negated by the

[70] Ibid. 231. (Partch's original article was unavailable at the time of writing)
[71] Partch, *Genesis*, 46.
[72] A Corporeal music "must be intimate to escape dependence on the Abstractionist technicians, who would not understand it, like it, play it; it must be intimate to provide an affirmative and individual relief from the pretentious values and fallacious standardisations of the concert hall, from the impersonal ubiquity of the radio (which could be very personal), and from the mass and unthinking reactions to mass inculcations." (Ibid. 61.)

[73] Ibid. 62.

abstract world of musical dialogues performed by homogenous bodies of musicians. In the opening chapter of *Genesis*, Partch states that

> simple repetition does not, and cannot, fulfil the creative urges of a person. He is living his, a new, life, and though he is a generated bundle of physical and mental similarities to millions of other entities, he is still a new being. Neither physically nor mentally is he a simple repetition.[74]

It is therefore by a differentiation from other artistic pasts, and avoidance of thoughtless subservience to the decayed forms of history, that Partch the artist attempts to realise a critique of traditional musical - and therefore aesthetic – values and arrive at an art with an immediate and corporeal relation to the present

But it is not only a desire to reinstate individual expression and human communication that characterises Partch's corporeal philosophy. His criticism of the meaninglessness of absolute music raises general questions of meaning in both music and language. One must resolve the conflict between abstraction and Partch's physically corporeal art in order to reveal the validity of corporeality as a general musical aesthetic.[75] It will be suggested that this conflict lies in the *object* and location of these 'corporeal' qualities, specifically speaking, that corporealism must deal with the problem of reification at the level of musical materials themselves. Partch's reactionary move away from musical sounds as a potentially self-contained expressive mode, leaves the story of the reification of these sounds in cultural life untold, by posing a solution that moves into another realm, with its own implicit problematic. Once again we find the obfuscatory character of the "hiding game" of isolated realms.

The position of words in language provides a powerful analogy for the problem of musical materials, especially as this problem relates to Partch's critique of abstract music The individual characteristics of words, beyond their signification, are given little thought

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[74] Ibid, 3.

[75] According to Nietzsche, writing on the lyric art of the Greeks from a Schopenhauerian (abstract) perspective in *The Birth of Tragedy*, lyric poetry is dependent on the spirit of music which does not "*require* the picture and the concept, but only endures them as accompaniments [..] The poems of the

as they are used in everyday discourse. Because the function of language does not require an analysis of individual terms, their individual qualities are rendered somewhat irrelevant. Ferdinand deSaussure was well aware of this, posing a linguistic theory that sought to look beyond etymological considerations – what he called the diachronic aspects of language – to the systemic signification or 'synchronic' aspects of signs. This programme formed the conceptual basis of both Structuralism and Semiology, modes of analysis concerned with the nature of particulars as they related to general frameworks. For Saussure the sign itself, in its material manifestation, is an arbitrary particular that only acquires meaning by its existence in a language or set of conventions, what has been referred to above as 'second nature.'

But in the realm of music, the physical characteristics of musical materials require a greater importance if this music attempts to access a realm beyond the everyday and beyond 'second nature.' A corporeal attitude to musical materials themselves requires a reinstatement of the particular. Musical sounds can be used to this end so as to deny functional reference in the linguistic sense, and to draw the attention towards a world beyond the arbitrary relations dictated by society.

Partch's treatment of words in the *Li Po* settings attempts to draw the attention back to the individual phenomenon, to the reality of words beyond their function as arbitrary referential terms. It is this concentration on the *Ding an sich* that Partch believed was the only remedy to the hopelessness of the individual's position within the collective. Just as music has the capacity to render specificity beyond functionality, the individual artist has the potential to assert a unit existence in the face of the code of the general. Partch did not, however, see the possibility of a corporeality of musical materials themselves. It will be shown that this possibility is implicit in Johnston's theory of "proportionality."[76]

It is the material content of the voice, its tonal qualities, which are represented in the tones of Partch's musical commentary in *Li Po*: a mirror in a purely physical sense

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lyrist can express nothing which has not already been contained in the vast universality and absoluteness of the music which compelled him to use figurative speech." (Nietzsche, *Tragedy*, 55)

[76] See "Ben Johnston's Proportionality as Integral Organisation."

Partch chooses to echo the physical content of words in his musical mirror. By accentuating the sound world of speech he attempts to draw our attention away from word reference to word musicality, from common meaning to individual meaning. Yet in doing this he proposes a far too obvious definition of meaning, a definition rooted in the daily functionality of language as a primarily verbal and interpersonal phenomenon. His music is therefore in danger of being subsumed into the very phenomenon of reification that subsumes and dissolves the meaning of words.

Noam Chomsky has recently suggested[77] that our ability to create or learn a language is a general human faculty, one that is realised according to exposure. Exposure to a given language acts upon an initial state that is genetically determined.[78] This initial state is a set of parameters[79] and a common human possession,[80] which in his 1966 work *Cartesian Linguistics* Chomsky already referred to as "a species specific capacity" for communication.[81] Similarly, the languages of different cultures are in actual fact remarkably similar because they are all realisations of an initial parameter that is species specific and for all intents and purposes, invariant. As a result Chomsky's rational Martian scientist will find only one human language with minor variants[82] that merely reflect variations of experience rather than variable language faculties. This faculty manifests as an ability to generalise and delineate patterns. Chomsky refers to our innate ability to create a language as an "initial language faculty" called the I-Language, where 'I' refers to this faculty's 'internal' and 'individual' status.[83]

It can therefore be seen that our linguistic paradigms form particular realisations of the general potential for meaning, or more importantly for functional language, the potential to mentally organise patterns of verbal sounds and form a complex network of referential relationships. Looking at the I-language from the point of view of Saussurean

[77] Chomsky, *New Horizons*, 71.
[78] Ibid. 4
[79] Ibid. 8.
[80] Ibid. 78.
[81] Chomsky, *Cartesian Linguistics*, 4
[82] Chomsky, *New Horizons*, 118.

[83] Ibid. 118.

arbitrariness, which reminds us that the forms of words have only an arbitrary relation to their objects, one finds that this faculty does not determine the specifics of the linguistic objects with which one refers to concepts.[84] The initial language faculty does not, therefore, determine the connection of the word 'tree' with the object that is connected to it according to an English reference; this is derived rather from exposure to a specific language, what Chomsky calls "learning by forgetting."[85] This is so because more possibilities are available from the start, from the pure or ideal state of the language faculty: "newborns are sensitive to *all* contrasts that can appear in *all* languages."[86] As a result both descriptions of language and the forms of language to which are usually ascribed meaning, are "taxonomic artefacts"[87] which result from far more general possibilities, either of speech or of human cognition in general. Simply put, we may speak with meaning yet we do not use meaning to speak

The idea of arbitrariness and its relations to musical materials has relevance to the traditionally fixed theoretical characterisation of historically derived musical materials. As will be shown in more detail later, the organisational model characteristic of a particular musical form can be broken away from what is in actual fact an arbitrary musical form, which merely *represents* this model. This follows from the idea that a descriptive model cannot fully encompass the reality it seeks to represent, which is Adorno's concept of non-identity; a part cannot tell the full story of the whole. Conversely, and as a result of this observation, it becomes possible to rethink the location of this organisational model. We must thus examine whether the model results as a consequence of an object, or as a consequence of the means by which the subject *interprets* that object [88]

As noted by Lukács above, this arbitrary relation between the means of this interpretation and the object itself, is usually one of cultural origin. This can clearly be seen using

[84] Ibid. 120.
[85] Ibid. 122
[86] Ibid. 118
[87] Ibid. 123.
[88] Harry Partch provides a physicalist account of this interpretation when he accords greater significance to the physiological mechanism of the subject's ear than to the object itself

Johnston's model of "proportionality," which, it will be shown, can be applied to Western harmonic music and Carnatic percussion theory. The former manifests as an abstract organisational model of proportionality with relation to models such as sonata form, a particularly defined arrangement of modulations from a central pitch, while the latter finds the structural applications of proportionality in rhythmic calculations or 'Tala.'[89] One can therefore see that a pattern-forming faculty, manifesting specifically as a proportional organisation of phenomena, is evident in two distinct musical traditions. Both use proportionality according to their potential to form mnemonic links on a large scale, and thus to create large-scale forms. In this sense it is suggested that the same organisational faculties can be corporealy expressed by seemingly distinct materials, in this instance through pitch and rhythm.

Historically speaking, Western music has tended to interpret its organisational devices as static and object-specific absolutes. Forms of organisation have remained inextricably linked to their corporeal expressions. The possibility of integral organisation across musical parameters has only recently been developed, but in a mechanical sense, in the integral serialism developed during the forties and fifties. There remains, however, a distinct lack of cross-pollination between parameters in single musical traditions. This, it will be argued, may be due to an attitude of misplaced concreteness towards musical materials, especially evident in the object-locked attitude of musical theories. This attitude is, as Partch has noted, bound up in the forms by which music is expressed, forms which he believed have become too standardised – read reified - to be of value to the creative artist. More specifically, these forms are primarily the intonation of instruments and their notation. Both will be dealt with in some depth later. But no less important are the theoretical concepts arising from these devices, and the tendency to forget that, for example, a rhythmic system can be seen to be merely an *expression* of an organisational

[89] The Tala defines a large-scale rhythmic order from the point of view of a central pulse manifesting as an eight-beat cycle with specific points of focus. In addition a particular starting point (called Eduppu) is specified for each composition, which serves as a point of cadential resolution to which all digressions such as Gathi Bedams (pulse modulations) and rhythmically dissonant cadential forms must eventually conform. Such forms are most notably evident in the various forms of Mora and Korvais (a Korvai is notated and analysed in the Addendum).

model, and that this model is not immanent to the form by which a culture chooses to represent it.

The illumination of the arbitrary relation between an organisational model and its form of presentation or material manifestation has the potential to form a powerful critique of the fetish tendencies of musical theory. This critique reaches closer to the kernel of the reified nature of artforms than does Partch's. An object-locked definition of meaning (i.e. one bound up in linguistics), such as Partch proposes is evident in ancient Greek corporeal aesthetics, confounds the crisis in exclusively *musical* syntax of Partch's contemporaries more than it remedies it. Reactionary movements such as Partch's often leave the original problem intact and untouched. In fact, they often serve to preserve the original and problematic traditions in museum-like realities, validating rather than negating them. By proposing new devices from new areas of specialisation, as diagnosis, a new veil is lowered, allowing the pre-existent materials to act as a scapegoat for a more general crisis. In this way reaction installs the crisis into a material reality by a dubious sleight of hand. Acts of conceptual force have as much impotence in the realm of the aesthetic as they do against general hegemonic power structure. Acts of force remain purely aleatory if they are not supported by relationships of strength to which all relevant parties consent.[90] It is for this reason that a significantly more fundamental and generally applicable critique of musical materials is required in order to unlock those aspects of Partch's theory which have an aesthetic relevance outside of his own compositional language.

Johnston is close to the mark when he says that Partch risks being seen as a kind of "patron saint of dropout artists"[91] because he failed to form strong conceptual links between his own music and traditional theory. His action is essentially a reaction against a force that could only benefit from his opposition. There are few composers that would choose to make the necessary break from their cultural heritage so as to delve into the state of comparative anarchy that Partch suggests. What he proposes is merely an

[90] Eco, *Faith*, 247.
[91] Johnston, "Beyond Harry Partch," 227

individual act of force, an object-dependent reaction or *ressentiment*,[92] which has little hope for success in a world of music dominated by affirmative discourse and self-forgetful second natures. If Partch's corporeal philosophy is to have a significance outside of his own works it becomes necessary to expand the realm of corporealism beyond narrative musical works and beyond the solo performance. One must examine, therefore, whether or not this aesthetic has the potential to inform general, mainstream musical aesthetics, and if so what mainstream theories achieve a similar end to Partch's.

To this end a look at Adorno's aesthetics provides an interesting contexualisation of Partch's corporealism. In comparison to Partch's programme of radical reorganisation, Adorno proposes that old forms be *reformulated* rather than rendered obsolete. Adorno sees the reified forms of commodity culture as holding the key to exposing the inconsistencies inherent to the structure of the reified consciousness. He proposes, therefore, that critical action must be located *inside* the phenomenon itself, aiming his critique at the fetish's presumptions to ontological immanence.[93] On a superficial level, the structure of the fetish seems to be one that is based on a consistent premise, one whose laws are a repetition of the general pattern or laws of the whole.[94] The apparently immanent character of the fetish makes it appear to be an expression of the totality, whereas any true view of this totality would instantly break the immanent image of the fetish and reveal its fragmented nature.

An immanent critique constitutes a demythologisation[95] of second nature forms.[96] This is achieved by challenging the apparent internal consistency of these forms; by pushing them beyond their own logical limits.

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[92] "While very noble morality develops from a triumphant affirmation of itself, slave morality from the outset says No to what is 'outside,' what is 'different,' what is 'not itself,' and *this* No is its creative deed. The inversion of the value-positing eye – this *need* to direct one's view outward instead of back to oneself – is the essence of *ressentiment* [.] its action is fundamentally *reaction*." (Nietzsche, *Genealogy*, 36-37)

[93] In the technical sense implied here, immanence refers to the permanent or indwelling characteristics of phenomena; the Latin *manOre* translates as 'to remain.'

[94] *Routledge*, 43.

[95] Demythologisation is to progress from the myth of "absolute origins" and from the idea of a "pure being beyond history." (Buck-Morss, *Origins*, 92.)

[96] Paddison, *Adorno*, 55.

In accordance with Adorno's appropriation of the Hegelian dialectic of identity and non-identity, any system contains a conceptual breach...a rupture which allows for critique of the system in terms of itself. Furthermore, because no system of thought is identical with itself, its immanent critique will reflect other systems of thought and behaviour [97]

This challenge of immanence or identity thinking – the belief that the description of an event is identical with the event itself – occurs as an "argument from within, on the basis of [the phenomena's] own inherent, historically developed logic "[98] Because the image of this logic as rigidly representative of material reality is, at root, a flawed one, the full revelation of a phenomenon's properties must reveal its true image, beyond the fetish. Criticism of the immanent characteristics of second nature forms is therefore a concern to clear away old ideologies by using the past against itself.[99]

Before a new culture can fully replace an old one there must be actively disintegrative forces to clear away the old ways.[100]

Adorno attributed realisation of this need for a cultural *tabula rasa* to Schoenberg, who described just such a programme in his method of teaching presented in the *Theory of Harmony*:

Let the pupil learn the laws and effects of tonality just as if they still prevailed, but let him know of the tendencies that are leading toward their annulment. Let him know that the conditions leading to the dissolution of the system are inherent in the conditions upon which it was established [101]

Here Schoenberg clearly reveals his acknowledgement that to fully understand and to be able to utilise the system of harmonic tonality in one of its historical forms, one must

[97] Williams. *Music as Immanent Critique*. 188.
[98] Buck-Morss. *Origins*. 66.
[99] Ibid. 94
[100] Ben Johnston. "Being a Composer," 237

[101] Schoenberg. *Theory of Harmony*. 29.

have a firm knowledge of this system's general tendency towards self-annihilation. For the forms of this system to take on the image of a consistent theorem with eternal artistic validity, without acknowledgement of those aspects of it which do not stand up to critical analysis, the exercise of utilising the system must be an inherently false engagement. To truly master the techniques of the old masters one must, at this historic present removed from theirs, develop an understanding that delves deeper into the relationship between theory and reality than their understanding - from *within* - possibly could have. Conversely, to attempt to master a historical system exclusively from within this system would require a pretence and the fostering of a wilful ignorance.

Ben Johnston's application of expanded just intonation, under the model of proportionality, makes a significant step towards formulating an analytical/descriptive musical terminology with the potential of reaching the above theoretical aim. Johnston achieves this by bringing Partch's Monophonic ratio-thinking under the broader debate of tonality versus atonality, and triadic harmony versus twelve-tone organisation. The descriptive categories of his system imply a general organisational model with the capacity to reveal an integral approach to musical materials. Jonhston's programme calls into question the misleading nature of cultural and material specificity, which rigidly assigns particular modes of cognitive organisation to particular musical parameters, thus making it impossible to equate and cross-pollinate the devices of different muso-cultural paradigms The theoretical illumination of this misplaced concreteness is achieved by integrating musical materials and diverse systems under similar organisational models. The recognition of the diverse and non-identical nature of abstract organisational models - such as diatonic tonality - is a potential form of immanent critique, at both a theoretical and a compositional level. And it is this critique which can restore the immediate and corporeal meaning of a system of music by exposing those engagements with musical materials which are rooted, not in the present, the here and now, but in the past, in the abstract realm of history. It is this function of critical art which constitutes a generally applicable corporeal philosophy operating over and above Partch's "one voice."

Ben Johnston's 'Proportionality' as Integral Organisation

Johnston's concept of "proportionality" provides a general cognitive model, one which it will be shown, applies directly to both harmonic tonality in its traditional and expanded forms, and to the organisation of varying degrees of complexity in rhythmic events. The latter model can be clearly witnessed in the system of Carnatic percussion, the rhythmic system of Southern India, the basic structure of which will be described in Addendum 2.

The history of what Johnston calls "proportionality" as a compositional resource – as distinct from its traditional function as a descriptive theory[102] - begins with Harry Partch's Monophony, presented in *Genesis of a Music*. Partch dismisses all former musical vehicles; equal temperament, conventional staff notation and standard instruments. In the place of traditional harmonic theory comes an in-depth analysis of pitch relationships based on small-number ratios or proportions (see Addendum 1).

The wide applicability of a theory of centricity relying on the general notion of proportionality suggests a contrast between organisation on the one hand and presentation on the other. Proportionality has the potential to be a free-floating concept without a necessary musical object. At the same time it encompasses aspects of object-specific theories of musical *presentation* such as *tonalité moderne*[103] and Carnatic percussion theory. This is not to say that forms of presentation do not rely on organisational principles. It merely suggests that the autonomy of a mode of organisation is often obscured by an unnecessary attachment to a form of presentation. Theories relying on contrasting levels of tonal complexity will continue to remain distinct from theories that rely on contrasting levels of rhythmic complexity if their modes of organisation are not differentiated from their modes of presentation. Through the elucidation of the parallels between ratio based pitch structures and similarly organised rhythmic structures, the

[102] "Musicians, as well as philosophers and physicists, have generally contented themselves with saying in effect that human minds were in some unknown manner constituted so as to discover the numerical relation of musical vibrations, and to have a peculiar pleasure in contemplating simple ratios which are readily comprehensible." (Helmholtz, *Sensation*, 2.)

[103] The term employed by Fétis to describe tonal music of the seventeenth through the nineteenth century (Dahlhaus, *Tonality*, 8.)

importance of differentiating between the organisational aspects of musical structures and their physical manifestations will become evident.

A general feature of the outside-time characteristics of music in European art-music before the twentieth century is its reference to one or many tonal centres. Ben Johnston's philosophy suggests a less materialistic reading of centricity than that suggested by conventional triadic tonality. Johnston's new outside time 'material' is his concept of 'proportionality.' This concept implies both a centricity that is distinct from the systemic limitations of forms of tonal cohesion implied by triadic tonality, and a form of centricity which is distinct from systems dealing exclusively with *tonal* aspects of musical organisation. In their original forms the organisational models of a 'community' must remain remote to objects outside of their immediate framework. It is, however, possible and highly illuminating, to take the ideas of a 'community' into new realms not by the negation of these ideas, but by continuing to deal with their forms of reference beyond the boundaries stipulated by their arbitrary historic and physical manifestations. In this way unquestioned historical conventions are allowed to grow beyond their original forms.

Anton Webern's instrumental textures suggest that organisation can remain distinct from the physicalities of a musical presentation. Webern's music suggests that vertical and homogenous listening habits arose from the textural *presentation* of the Rococo period, a mode of musical thinking which, today, is unconsciously imposed on linearly conceived, polyphonic musics; and that because we have learnt to understand Baroque polyphony by its harmonic implications, today's audiences experience a fundamentally different mode of musical organisation from that of a Baroque audience. The fragmented textures of pointillist orchestration, evident in Webern's orchestration of the *Ricercare* from Bach's *Musical Offering*, attempt to reinstate a mode of perception by inverting the mode of presentation. Webern achieves this by disturbing the timbral coherence of the melodic line, distributing the individual elements of a single musical idea throughout the textural resources of the orchestra. Webern's aim is to counteract a homogenous reaction to polyphony by timbrally masking the voice-leadings and thus disrupting the 'logical'

connection between chords. This achieves in the linear dimension what polyphonic music intends in the harmonic: a fragmentation of one axis to enhance the independence of the other. This inversion of linear and vertical thought aims to restore the historic truth-value of an early music by restoring the image of its decayed form. Webern thus acknowledges that, as Helmut Rilling has pointed out, while we may have an authentic performance practice of early music in place today, "we have no original listeners."[104]

Johnson's paper "Scalar Order as a Compositional Resource" analyses 'harmonic' and 'melodic' forms as distinct psychoacoustical terms, suggesting that although they are fairly distinct when understood as forms of musical presentation, their actual delineation is essentially complex and difficult to differentiate. Johnston's pitch scales suggest, like Webern's orchestration, that melodic and harmonic presentation of musical materials can be interpreted as particular instances of more general types of musical organisation.

Johnston establishes a hierarchical description of both musical cognition and materials.[105] A scale of musical pitches is a combination of both harmonic and melodic possibilities. These categories (both simultaneously and independently) define the structure of the material, what Johnston calls its "scalar order."[106] Scalar order is an aspect of the outside-time structure of musical materials. Johnston then goes on to describe the manipulation of this structure in a composition:

> The psychological tension between a particular scalar order and the pattern imposed upon it by composition stimulates attention, memory, and interest. The interrelation of many such patterns stimulates associations, memories and images having similar patterns. Whether I experience these associations as sensory images, as emotional effects, or abstract patterns, the music has *meaning* because of them.[107]

Furthermore:

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[104] Quoted in Wegman, "'Musical understanding' in the 15th Century," 47.
[105] Gilmore, "Metaphor," 475.
[106] Johnston, "Scalar Order," 58.
[107] Loc. cit.

[A composer] can make patterns of melody or harmony by using pitches according to rules of composition which are based upon rearranging these two kinds [harmonic and melodic] of scalar order.[108]

Johnston interprets melodic-type organisation as "interval scale" measurement, which arranges its terms in precisely defined pitch steps "in which the intervals of difference between the items are equal." [109] Harmonic thinking, on the other hand, is strictly hierarchical, emphasising precise relationships between its factors by ratios. As a result these "ratio scales" have unequal intervals between degrees (evident in just-tuned scales). A ratio scale – which Johnston calls "proportionality" - does not therefore refer to "any equally segmented linear scale or measurement" because all proportional divisions must divide the octave into unequal segments.[110]

Historically speaking, both of these scales are evident in equal temperament. Because the twelve tones create a uniform division of the octave, they necessarily form an interval scale. At the same time Johnston asserts that equal temperament must be understood as an abstraction of a ratio scale, in that though the actual ratio terms (pure harmonic relationships) are not present, the ear interprets the tempered versions sufficiently well in music based on harmonic relationships for there to be no question of their reference to a "rational order."[111] In reference to the harmonic or proportional applications of equal temperament, Randall Shinn writes that.

a finite number of pitches (such as twelve) is able to represent more intervals than are actually present because one's mind habitually assumes that the interval heard is an out of tune version of a simpler (in tune) interval (proportion) appropriate to the context. Thus on hearing C to G on the piano, our usual assumption is that the interval intended was a perfect fifth, 3:2, which in actuality is not the interval that the instrument produced. [...] the ear *can* hear the difference by comparison.[112]

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[108] Loc. cit.
[109] Ibid. 57.
[110] Shinn, "Fourth Quartet," 145
[111] Johnston uses the term "rational" as a reference to proportionality.

[112] Ibid. 148.

Lloyd writes that

everyone knows that equal temperament is an acoustical compromise [.] designed to satisfy as completely as possible three incompatible requirements – true intonation, complete freedom of modulation and convenience in practical use on keyboard instruments.[113]

The important difference between these two scalar forms is that ratio scales include the "ordering potential" of interval scales, while interval scales do not yield proportional potentialities; except by abstract reference.[114]

Johnston defined the characteristics of these organisational principles as follows

Interval scale thinking emphasises symmetry of design. The harmonic and tonal meaning of symmetrical pitch structures is *ambiguity*. Chordally they produce either a sense of multiple root possibilities or of no satisfactory root possibility. Tonally they cause either a sense of several possible tonics or of no adequate tonic. Ratio scale thinking, on the contrary, emphasises hierarchical subordination of details to the whole or to common reference points. The harmonic and tonal meaning of proportional pitch structures is clarity and sense of direction.[115]

The major step in Johnston's thinking with regard to integrated approaches to musical organisation is achieved by applying to pitch terms usually used to designate rhythmic qualities; specifically by defining tone as "different modes of vibration."[116] Johnston writes that

[a] *harmonious* sound is caused by an ensemble of tempos of vibration which measure off simple proportions of duration. Harmoniousness, or consonance, is the experience of simple proportionality in vibration patterns, whether of a single complex sound or of combinations of simultaneous sounds.[117]

[113] Lloyd, *Temperaments*, 68.
[114] Johnston, "Scalar Order", 75.
[115] Ibid, 74
[116] Johnston, "Scalar Order," 56.
[117] Ibid, 58-59

In this sense pitches are varying speeds of vibration and although they are not perceived immediately as such, their *Gestalts* are perceived and organised at higher levels of cognition, as 'patterns' of what occurs at imperceptible levels. Johnston therefore writes "to listen *musically* is to turn one's attention to details of the sound patterns and to interrelations of these patterns on different time scales."[118]

The above modes of scale ordering do not necessarily refer to the manner in which musical objects (rhythms, pitches etc.) are *presented*, but rather to the manner in which they are *organised*. These levels of organisation are then made possible as levels of the cognitive organisation of the listener by exemplifying them through the interplay of the musical materials in a composition. Interval scale ordering, for example, does not refer exclusively to 'melodic' and/or vertical means of composing, but rather to a specific mode of musical cognition, which is potentially a direct transference of the organisational model perceived in the material itself. This is not, however exclusive to the form of musical presentation. The faculty for interval scale ordering happens, in historical musics, to have been equated with melodic or linear writing. Johnston's analysis suggests that this need not be the case; that this is rather a particular expression of the *possibility* of a particular mode of cognition - a particular psychological state – and consequently a particular mode of musical organisation. Ratio scale ordering, which is historically speaking a means of macro-structural organisation (manifesting as the *tonalité moderne* of the 17th-19th centuries) - to which the lower level of melody is frequently subordinated – therefore takes on a larger significance throughout the gamut of musical possibilities. One is reminded here of Chomsky's I-language cited above, the individual's faculty for language, independent of the actual manifestations which are defined by a particular linguistic system.

[118] Ibid. 56-57

Historically speaking, ratio-based thinking manifests as centric[119] composition, in that all ratio measurements rely on a *common reference point* or unity. A ratio only has meaning as a comparison, for example four thirds *of* one. As a result a "meaningful conception of zero value of the attribute in question is necessary before such a [ratio] scale can be formed."[120] Because a point of reference is necessary to define a ratio scale level of organisation, centricity (the reference of diverse particulars to a common point) is inherent in the very structure of ratio pitch scales. Proportionality relies on a common reference point, such as the implicit or explicit root of a complex sonority. Johnston cites "the *root* of a chord, the *tonic* of a tonality, the *principle tonality* of a modulating movement" as the usual examples of such common reference points (zero values) in music.[121]

Applying the same principle to rhythm, Johnston writes that "as long as all proportions are referred to unity, there is a single tempo." No matter how many contrasting events there may be in a rhythmic counterpoint, a common denominator (or unifying pulse) creates reference on a ratio scale to a single macro-structure or unity.[122]

Since proportionality deals specifically with centric thinking, it has mnemonic power in its ability to allow the listener to create associations on a macro-scale. These are evident in Johnston's model of musical cognition as the organisation of complex micro-levels or "tempos of vibration" to the macro-scale patterns of musical form. Listening to music in this manner relies on memory to create referential patterns between the various levels and time frames of a composition. Linear or interval scale ordering of pitch, on the other hand, has less potential to facilitate large-scale mnemonic relationships.[123]

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[119] Shinn uses the word 'centric' as a "deliberate avoidance of the word 'tonal'," which he rightly asserts has become too integrally related with triadic music to be used in other contexts where the meaning is greatly altered. (Shinn, "Fourth Quartet.")
[120] Johnston, "Scalar Order," 57
[121] Ibid. 61.
[122] Ibid. 62.

[123] Ibid. 61

Harmonic or proportional listening, applied to seemingly non-harmonic or interval scale events, organise the latter in terms of an implicit harmonic structure. This kind of listening is exemplified in Bach's Sonatas and Partitas for Solo Violin, where harmonic events are expressed using largely non-harmonic textures. The physical differentiation between vertical structure and linear structure is thereby rendered ambiguous. The resulting effect is a subordination of the melodic material's interval scale organisation to the *inclusive* level of proportionality. One must therefore keep in mind that ratio scales encompass interval ones as a structural possibility while adding one more requirement. It is therefore possible to have terms which are melodically but not harmonically organised (in the sense of Johnston's definition), but *not* vice versa. Therefore tonal melody is a ratio scale organisation of linear terms.

Interval scale thinking represents the kind of thinking found in serial and atonal composition. The serial idea of "vertical melody", for example, relies on a simultaneous sounding of the elements of a tone row (elements measurable by interval scale). The fact that these vertical sonorities are intentionally of melodic significance relies on the negation of any implied centricity or common reference point, i.e. there should be no structural hierarchy. This can be achieved by avoiding simultaneously sounded tones that are related by simple ratio relationships. Consequently Johnston writes that "it should be hard to hear these combinations as chords subordinated to roots [reference points] blend should be under-emphasised."[124] Johnston attributes the techniques and "prohibitions" of serial composition as a reference to this principle,[125] as distinct avoidance of any organisation of material that implies a reference tone. The tone row provides a means of contradicting the ratio scale relationships implicit in the chromatic scale by deliberately avoiding those relationships which are proportionally - i.e. harmonically - related.

In our time, the resources of ratio scale pitch organisation have come to seem exhausted and outmoded. Thus there has been a deliberate reliance upon less sophisticated organisational

[124] Ibid, 61.
[125] Loc. cit.

techniques: interval scale, ordinal scale, and nominal[126] scale methods of creating musical order.[127]

Johnston's solution to the problem of "outmoded" musical materials (contentious issues aside) radically reorganises the nomenclature and proposes a musical programme reliant on the resources of an extended just intonation, the specifics of which do not fall under the present subject. In his view a move to expanded systems of proportionality is vital so as not to "entirely suspend the action of our intelligences on [the level of ratio scale ordering] so as to attend exclusively to other kinds of order." [128] Rather than avoiding the physical manifestations of the cognitive possibility of ratio scales, and thereby denying an inherent cognitive faculty of organisation, Johnston emphasises the importance of uncovering more complex techniques of rational organisation, techniques which are not possible in the interval scale abstraction of the finite ratio scale resources provided by twelve-tone equal temperament.[129]

Although Johnston's critique of traditional categories is consonant with the spirit of Harry Partch's own theoretical programme, it differs in approach by remaining firmly within the tradition of Western music, thereby facilitating a critique of the idea that modes of musical organisation are immanent to forms of musical presentation. Partch's reactive negation – his theoretical *ressentiment* - essentially negates and excludes the possibility of creating new readings of the aesthetic history that documents the history of a culture, while simultaneously making it difficult to attach broader musical significance to the wealth of theoretical observations in *Genesis of a Music*. Johnston achieves a considerably wider theoretical significance by bringing new concepts to familiar realms, making it possible to decipher terminological specificity that reflect the immanent nature of common-practice (re)presentations.

[126] Johnston explains that a "nominal scale is a collection of equivalent and exchangeable items" while an ordinal scale is a collection which is rank-ordered in terms of some attribute." Ibid. 57.
[127] Ibid. 74.
[128] Ibid. 75
[129] Loc. cit.

Johnston's reorganisation of musical nomenclature brings us closer to breaking the link between forms of organisation and their limited expression in a particular musical system. This is necessary if the former is not to descend completely to the status of empty cultural signs An effective means of critique at the level of musical materials is therefore to subvert this tendency towards immanent readings, of centricity, of atonality. These material manifestations of abstract organisational models have a tendency to decay, and to pose as the thing itself, at which point they lose their diverse creative potential. The following will show that the potential of ratio scale arrangement is an arrangement of *values* of complexity and relative stability, and by no means merely a set of pitch relations. This will show that an integral musical resource can draw on the potential of ratio scale or proportional organisation in the same way that integral serialism crossed musical parameters within the bounds of interval (for pitch) and ordinal (rhythmic and dynamic) scales. An integral proportionality has the added structural bonus of being a means of measuring macro-scale complexity, the latter being a concern in the work of theorists such as Rameau and Hindemith, as will be seen.[130]

[130] For an explanation of proportionality as a descriptive system applied to Carnatic rhythmic theory see Addendum 2.

Notation as Systemic Representation

"Varèse's art brings to an end the tyranny of the stave, and that is something more pregnant with consequences than the escape from the prison of tonality." (Jean Vallérand)[131]

The following analysis of Ben Johnston's notation of Partch's *Barstow: 8 Hitchhiker Inscriptions*, for an expanded just intonation (in that it is a musical theory as such) suggests that his is a theory that makes few demands on material as regards structural relationships. The notation therefore leaves the question of the nature of the material, up to the art of composition itself. Johnston's notation can, however, be understood as having a theoretical, and therefore epistemological, underpinning in that its structural basis is that of a just intonation major scale; a tonic and its two dominants defined by the 1-3-5 model. In this sense Johnston obscures Partch's specific commentary on 5-limit diatonic music. the material no longer speaks as a critique of the latter, but does provide a model for the growth of its material

Saussure's linguistic theory rests on a dichotomic categorisation of the "systemised set of conventions necessary for communication"[132] comprising two analytical poles, *langue* and *parole*, each with its own distinct role in the process of communication. For Saussure the *langue* is the vital reference point allowing the meaning of an individual utterance to be conveyed between individuals. The *langue* is by necessity a non-individual phenomenon existing apart from individual usage. Historically, the *langue* is the sum total of individual usage: the codified rules that are continuously modified through speech (*parole*). The *langue* does not, however, necessarily hold *a priori* historical significance over the utterance or *parole*, but functions merely as an analytical model as well as a reference point for the user; a primary point of departure in the analysis of a message. Partch's "one voice" is characterised in the Saussurian system by the level of *parole*: "'*speech*' is essentially an individual act of selection and actualisation" the goal of which

[131] Ouellete, *Varèse*, 212.
[132] Barthes, *Semiology*, 13.

is to express personal thought."[133] Fundamental to *parole* is the recurrence of set objects in a combinative act. While the *langue* is a functional theoretical abstraction,[134] *parole* is the actual object of study; the utterance or artwork; the act which (linguistic) analysis seeks to explain. Langue and parole are thus in a genuinely dialectical relationship where the "language is at the same time the product and the instrument of speech."[135]

The notion of *langue* is valuable as a means of understanding the conceptual importance of notations as idealised realms. The formation or criticism of a notation occurs outside-time and therefore impacts on individual works without taking them into account. A notation is necessary for the production of a musical work, be it an actual system of signs or merely the possibilities presented by an instrument or musical style. These are representations of an 'ontological commitment' or conceptual framework.

The relationship of Monophony to its predecessor, namely diatonic pitch organisation, must be analysed in order to find the basis on which Monophony's notation can draw. Should that relationship become clear, Partch's system may be conceptualised not as a negation of traditional musical values, but as an expansion of a number of the latter's inherent principles. In this sense Monophony has the potential to act as an immanent criticism of traditional theoretical orientations, by questioning them from *within*.

In *Time, Notation and Coding* Boulez describes the evolution of musical notations as "reductional reproductions."[136] A "new formal system becomes correspondingly wider than the old and in a sense subsumes it."[137] Boulez uses the model of notation as an illustration of rational progress in music:

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[133] Ibid. 14.
[134] The analogy is drawn to chess which can be played at many different times and undergo different combinations: "but it remains throughout the *same* game." (Barthes, *Semiology*, 249.)
[135] Ibid. 17.
[136] Boulez, *Orientations*, 85.
[137] Ibid. 84.

the logical evolution of any language must – and historically speaking always does – take the following form: ideas that are more 'general' and more 'abstract' at every stage replace those of the foregoing period. Thus the logical evolution of music appears as a series of 'reductions.' [138]

In this way Boulez explains musical 'progress' as the reduction of the distinct and particular properties of one system, into the generalised parameters of a new one.

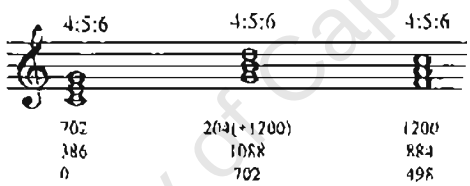
Boulez observes this progression in the relationship between 'neumatic' or linear notation on the one hand, and symbolic notation on the other. Neumatic notation relies on the particularities of the materials that it represents. It cannot function without or beyond these particularities. Conversely, symbolic notation lacks the stylistic subtlety of the plainchant's neumes, facilitating a new and wider realm of possibilities by defining less ambiguous and more finitely differentiated parameters.

This process is also evident in the progression from the mensural notation of the French Ars Nova, to the more abstracted or generalised - less object-specific modern binary notation. In order to interpret the duration of a note value in the mensural system, the performer must rely on those notes surrounding the sign as well as on the mensural sign, which acts as a signifier at the level of the total work. For example, a note-value has either binary or ternary value,[139] The individual characters[140]of mensural notation are not therefore autonomous symbols,[141] but are contingent on the legislation of symbols at higher levels in the system. Symbol reference is therefore determined by a hierarchical arrangement of the characters comprising the symbol system All levels of the modern notational system on the other hand, are organised by the same parameters Modern binary notation is non-hierarchical and democratic in its legislation; the contingent individual characters of the mensural system develop into autonomous symbols, with a fixed and independent reference.

[138] Loc.cit.
[139] "[In] the early fourteenth century any sort of measuring must have meant a use of duodecimal fractions or fractions dividing the whole into two or three parts." (Busse Berger, *Mensural*, 33)
[140] 'Characters' are groups of 'marks' that are defined as belonging to one symbol (Elgin, *Reference*, 97.)
[141] Symbol systems such as musical scores refer to their objects (musical sounds) by denoting (Loc. cit.)

The process of rationalisation in rhythmic notation therefore seems to be one of decreasing ambiguity and increasing autonomy of specific signs, which are increasingly materialistic, significant and absolute. As they gain autonomous status, signs undergo a process of reification: they attain 'this-ness.' Because autonomous signs do not necessarily have to refer back to the systems of which they are a part, they are often taken to be free-floating objects and their internal reference, i.e. how they relate to other symbols in the referential system, is concealed.

Notation and the ideas it embodies are therefore double-edged swords, both representative and authoritative: they simultaneously act as referential symbols and legislators in their relation to musical sounds, and in this sense are both the object of analysis and a vehicle for the progression of the materials they represent



Ben Johnston's notation of just intonation, used in his arrangement of Partch's *Barstow* for string quartet (1994), is based on what he calls "C major just intonation" represented by three just major triads[142] F4-A5-C6, C4-E5-G6 and G4-B5-D6 [143] The uninflected (natural) notes of Johnston's staff notation are therefore representative of Riemann's structural degrees, the tonic and its two dominants

These basic major triads of the major scale are arrived at by 5-limit tone generation (using ratios with multiples of five or under). As *a priori* constituents of the system, i.e. as first order tones, C major implies a fundamentally different syntax to that implied by Partch's Tonality Diamond and the language of ratios as will be shown.

[142] The tones of the just major triad are in the proportion of 4:5:6, representing the composite forms of the first three 'identities,' namely of 1,3 and 5.
[143] Arabic numerals refer to frequency ratios.

Johnston's notation then attributes a ratio (what he calls "commas and chromas"[144]) to standard accidentals:

#	sharpen by 70.7 cents or 25/24
b	flatten by 70.7 cents or 25/24

as well as to six new ones:

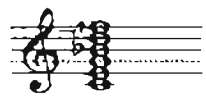
+	sharpen by 21.5 cents or 81/80
-	flatten 21.5 cents or 81/80
L	sharpen by 48.7 cents or 36/35
7	flatten by 48.7 cents or 36/35
↑	sharpen by 53.2 cents or 33/32
↓	flatten by 53.2 cents or 33/32

(Johnston also includes symbols for the 13, 17 and 19-limit ratios)

Because the staff acts as a fixed point of reference, a particular set of characters will always refer to the same pitch. There is no need, therefore, to know the position of Unity in order to find the pitch of, for example, G with the accidental '-' Uninflected G will always be determined as the 3 identity in the 4:5:6 triad from C, making it 702 cents. G- will consequently be valued at 702 minus 21.5 or 680.5. This pitch can then be designated as the 1/1 of a just intonation scale as is the case in Ben Johnston's fourth string quartet. The position of the ratios themselves – as increments of a fundamental – are therefore secondary characteristics, reliant on a fixed system of notation, just as the tonic pitch of a major scale may taken as any note in equal tempered notation. Middle C is therefore not necessarily 1/1, but rather always 0 cents, and conversely 1/1 is not always 0 cents. Where Partch arbitrarily chooses G as his Unity, Johnston has now found a means of representing just intonation ratios from the point of view of a fixed and autonomous notational system.

[144] Gilmore, "Metaphor," 480.

In this way 7/4 (968.8) from C1/1, for instance, is notated as a deviation from 'B' (1088.3c), requiring a lowering of 119.5c. The 'b' character lowers the tone by 70.7c leaving a remainder of 48.8 which is the value of the character '7.' Similarly, 11/8 (551.3c) is notated from 'F' (498c) requiring raising accidentals to the collective value of 53.3c or upward-facing arrow as above



C1/1 11-limit Otonal Hexad

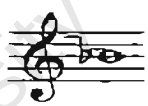
In the fourth string quartet 7/6 from '1/1G-' is notated as a composite of four autonomous ratio symbols:

B = 1088.3c

b = -70.7c

7 = -48.7c

- = -21.5c



This notation makes it possible to arrive at any tuning by retuning the standard C major scale derived from the two dominants by the ratio indicated by the accidentals. These accidentals can be used in combinations in order to provide a potentially infinite system. They do, however, abandon Partch's reference point of the Tonality Diamond, which functions as a conceptual map of the new sound realm It is probable that Johnston's notation takes modern notation *too literally* resulting in a discrete measurement of expanded just intonation intervals without providing a structural basis. A comparison of these two notations brings into clear focus the difference between so-called "Strict" and "Free" composition which Lou Harrison describes:

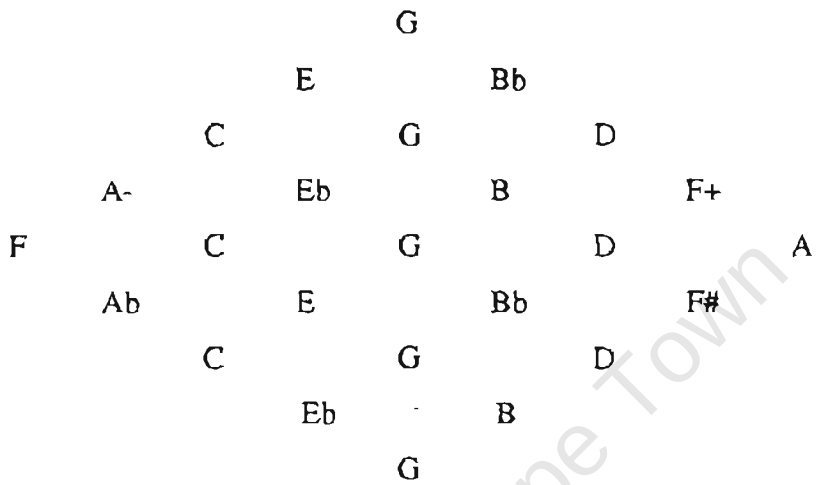
After only a brief study of intervals it becomes clear that there are two ways of composing with them: 1) arranging them into a fixed mode, or gamut, and then composing within that structure. This is Strict Style, and is the vastly predominant world method. However another way is possible - 2) to freely assemble, or compose with whatever intervals one feels that he needs as he goes along. This is Free Style.[145]

The following new proposition of a notation which is systemically denotative, rather than autonomous and finitely differentiated is based on Partch's concept of the tonality diamond and built on the grounds of traditional notation of tonal or centric structures. But because the notation is not reliant on the set of inter-relationships of the diamond, it can exceed its realm and achieve a potentially infinite system of tonal relationships. Thus each individual accidental has value only according to its context, i.e. to what note it is applied. Thus the 'F#' refers to that pitch a 5/4 or just major third above D (9/8) rather than being a composite of two values # = 70.7 and D = 9/8. The tuning of a note that must be harmonically realised by a performer (i.e. by ear) must also be realised harmonically (the systemic structure in this case) in the visual system. Johnston's notation as a juxtaposition of fixed value is an organisational model more closely aligned to organisations that are not proportional such as interval or nominal scales. One is reminded that proportionality is by definition a system that is syntactically dense, as it has similar terms with variable denotation contingent on a context within a system.

It is possible to arrive at the identities of the Tonality Diamond implied in equal temperament (or staff notation) using the 'traditional' note system in a subtly different way to that proposed by Johnston. These tones are those within the 5 limit of just intonation; the O- and Utonalities built from Unity with their 9 and 15 identity equivalents:

[145] Gilmore, "Metaphor," 480. Harrison's original was unavailable at the time of writing.

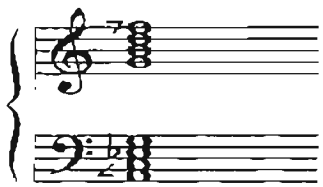
If these are further expanded by realising their potential as roots of their own tonalities, a Tonality Diamond is arrived at which represents the traditionally notated symbols (all except the tritone) from a fundamental of G.[146]



(The A- and F+ differ from their uninflected equivalents by a syntonic comma of 21.5 cents.)

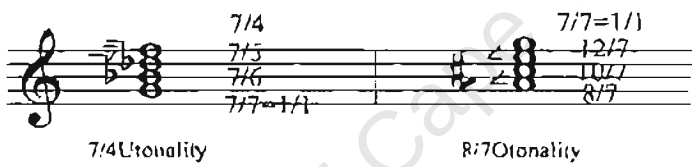
To expand the above diamond into the 11-limit requires new signs which will be borrowed from Johnston's notation, the difference being that they will be given less individual autonomy: they will have no meaning without the tones which they represent. In Johnston's notation all signs have unequivocal intervallic value, # is always 70.7 cents, 7 always 48.7 cents. If, however, these signs are assigned to pitches by means of the Diamond a notation results which relies on the 11-limit consonant sonorities themselves and *not the deviations from the C major scale.* The (consonant) 7-limit quartad both under and over a fundamental G - the 7-limit equivalent of Rameau's *perfect chord* - is notated as follows:

[146] The choice of tonic is arbitrary or at least instrument specific. The single tonic of Monophony implies that modulation as such occurs within the confines of a single overtone series.

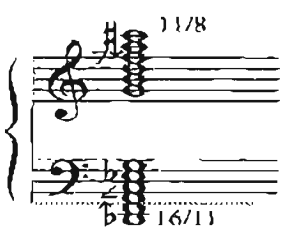


The F7 represents a flattened F natural (16/9) or the 7 odentity of an Otonality, while the AL represents a sharpened A natural (9/8) or the 7 udentity of a Utonality. The tones represented are 7/4 and 8/7 respectively. These two signs therefore represent these ratios – i.e. the intervals from a root of a tonality - rather than the specific degree of flattening or sharpening of the uninflected note as is the case with Johnston's system

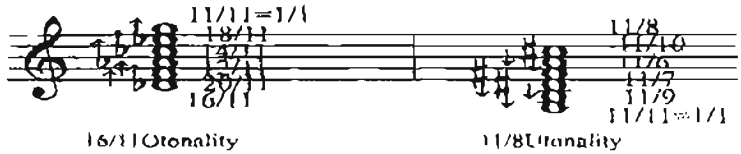
Because they are also potential 1 identities - due to the 1 udentity of 7/4 and the 1 odentity of 8/7 – both of these tones are potential roots of new tonalities as follows



These tones also provide 7 identities to all the 5-limit tonalities of the Diamond, thus completing a notation for 7-limit tonalities based on the structure of the 7-limit *perfect chord*. Similarly, the 11-limit tones are notated from the roots of their tonalities rather than as deviations from alphabetic notes:



Once again these have potential 1 identity (root) status; 16/11 as the root of the 11 Otonality and 11/8 as root of the 11 Utonality:



The addition of the latter two tonalities provides the notation of the full 11-limit Tonality Diamond.

As a practical expedient for traditionally-trained musicians Johnston's notation may be of use, but as a conceptual system it obfuscates the actual structure of Partch's Monophony making it unnecessarily obscure for the musical interpreter, theorist and composer alike; for anyone seeking to understand the structure of a Monophonic work The power and significance of Johnston's approach to notation is that it does not attempt to refer to the specific by means of a general systemic framework. In this sense it is in keeping with Boulez's notion of reductional reproductions.

It appears that the representation of the resources of expanded just intonation as a deviation from the comma (which is a product of non-monophonic thinking) generates more theoretical misconceptions than the user-friendly physiognomy of Johnston's autonomous signs attests. Complete autonomy of the representational system can only reinforce the fetishism implicit in abstract systems. The simplicity of immediate interpretation sacrifices the power of systemic relationships such as those represented by the diamond.

Understanding the sounds in terms of the Tonality Diamond and its implied relationships provides the musician with a concrete means to access sounds outside of their 5-limit tonal vocabulary. This in turn provides a possible escape from the *huis clos* of both notational system and ear-training.

If the idea of an *a priori* C major is abandoned, 11-limit thinking is freed from the conceptual limitations of the 5-limit, leaving only the diatonic scale's *perfect chord*. This

is the point of maximum repose, expanded to encompass a system defined by the identities 1-3-5-7-9-11-(13)-15 (13-limit ratios require new signs).

The difficulty with Johnston's notation is that it does not function as a 'Map' of Monophony as a tonal system; it is not representative of its structure.:

notation : system ≠ system : sound.

Partch's argument against arbitrary forms of notation attempted to rectify this incongruency, so that the musician may make full use of the conceptual model mapping the relationships between tonalities. At the outset of the theoretical explanation in *Genesis* Partch says:

It is well to plunge at once into ratio nomenclature and to disregard the more familiar `A-B-C` terminology by which the ratios in our conventional scales are expressed. The advantages of doing so, in opening up new tonal vistas, in getting to the analysable root of music and the core of the universal tone, are inestimable.[147]

Partch cites Max F Meyer as saying of ratios that "no other terms are safe from ambiguity" and therefore that "the musician who abhors numbers abhors the way leading toward an understanding of musicianship, an understanding of the psychology of music."[148]

Johnston's sensitisation of "A-B-C" terminology conceals a limitation of 5-limit thinking without providing a conceptual tool (and a practical tool) for uncovering the new resources of the expanded just intonation.

In a strictly referential sense, D (in C major, just intonation) denotes Monophony's 9/8 Yet this referential interpretation of signs denies their systemic significance, their significance in the totality of the semiological system. Denotation "is a two-place

[147] Partch, *Genesis*, 76.
[148] Ibid, 300.

semantic relation between a symbol and the object to which it applies."[149] In this sense 3/2 complies with the same class of objects as G, and similarly 9/8 to the same class as that tone a fifth above G or the 3/2 x 2 (C:G:**D**). (9/4 is brought within the octave to 9/8)

The linguist De Saussure postulated the arbitrary nature of the sign. This basic premise of his linguistic framework reminds us that our signifiers are learnt, habitual and arbitrary, and bear no physical resemblance to the signified. Partch's signs themselves are also arbitrary in their physical constitution, yet they do have the potential to plot the interrelationships of their signifieds (sounds) in the manner of mirrors or 'maps'. In this sense the ratio attempts to model what structural linguistics calls the *langue*. The *langue* is "a principle of classification" with first place among the facts of speech, representing "the norm of all other manifestations of speech."[150] The *langue* has only "potential life" [151]; it attempts to represent the 'rules of the game,' occurring outside time as pre-compositional formalism.

> Language is a system of inter-dependent terms in which the value of each term results solely from the simultaneous presence of the others.[152]

Monophony's *langue* is represented by the mandala or Tonality Diamond What is important to Partch is the systemic denotation of 9/8: its significance to the *langue* or Tonality Diamond. Thus the sound denoted by 9/8 has a meaning which is reliant on a meta-system consisting of other sounds, and the sign '9/8' attempts to represent this sound's relationship with the other sounds of its system. The sign is a signifier in a system of relationships, not a free-floating and arbitrary referent Any relationship in the system must therefore register in the notational system if the notation is to be systemically denotative.

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[149] Elgin, *Reference*, 19.
[150] Saussure, *Course*, 8.
[151] Ibid, 77.

[152] Harris, *Reading Saussure*, 242.

A notation of Partch's scale that avoids ratios must still seek to represent the fundamental syntax of his system and not impose another theoretical orientation. The basis of 13-limit Monophony is the seven-tone Otonality sonority and its inversion, the Utonality septad. These represent the expansion of the diatonic triads to seven-tone chordal groups. From the fundamental 1/1 is generated a 'perfect consonance' – a sonority in repose – both above and below itself. According to Partch "Utonality can create an aural sensation quite as definite as the visual sensation of a new moon,"[153] as different from its Otonal opposite as night is from day.

Partch's complete negation of traditional terminology characterises his approach to innovation in general, his violent disregard for old, decayed forms which were indicative of false inferences and a dogmatic approach to both music and sound. Partch believed that only a total reorganisation of the nomenclature could rectify the deeply rooted contradictions inherent in the musical development of the Western world. His focus was therefore more on Eastern thought and his own interpretation of Western harmonic development as a gradual acceptance of greater measures of dissonance (identity complexity).

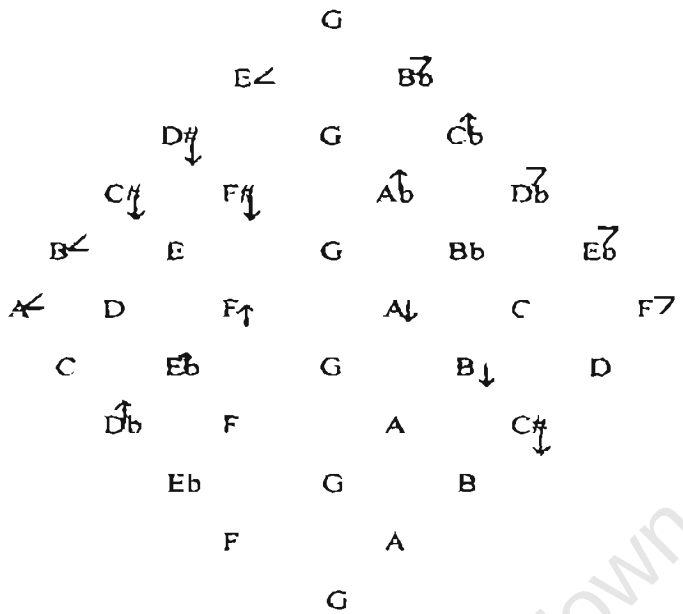
It must be admitted that, although ratio representation represents the "analysable root of tone," and therefore a supposedly 'first nature,' it denies the sociohistorical nature of musical materials. It is not, however, too much to ask of a notation that it represent in its own terms the elements of the system to which it refers. It is also possible that the notation may be used to unlock the relationship between the old and the new; to act as a mediator. In this sense the notation is both a bridge from the old to the new, and a form of critique of the old.

If the conventional stave is to be used as a notational basis one must find points of intersection between the 5-limit pitch system and the expanded realm of a system such as Partch's. Reinterpretation of both diatonic compositional devices and staff notation so as to include tones of the 11-limit should preface any comprehensive analysis of the

[153] Partch, *Genesis*, 89.

relationship between Monophony and diatonic tonality (*tonalité moderne*). Since conventionally trained musicians use the modern pitch notation resting on 5-limit diatonic assumptions, the notation of an expanded system of tonality should be premised on this system. I would suggest that this starting point would necessarily be one that is usually characterised as "Strict Composition" rather than Johnston's serial or "Free Style," namely a notation in which the closest relationships are clearly represented. Strict composition becomes necessary for a *tabula rasa* in the field of microtonal notation,[154] an example of which can be seen in the following diagram which proposes a realisation of Partch's tonality diamond using Johnston's symbols.[155]

[155] Comma distinctions, which are omitted here, can be indicated by Johnston's '+' and '-'



The Tonality Diamond According to Proposed Notation

Theories Anticipating 'Proportionality'

Fetis saw the basic idea of seventeenth- to eighteenth-century tonality or *tonalité moderne* as residing in the "consonant harmony called *accord parfait*, which has the quality of rest and conclusion, and the dissonant harmony, which causes tendency, attraction, and movement."[156] This 'perfect chord' is defined by Rameau as having vibrations in the proportion 4:5:6, an expression of what Descartes called the "three concordant numbers" which are 2,3 and 5, and their "composites" 4 and 6. Rameau's minor triad is similarly constructed - the only difference being the arrangement of the thirds and fifths - and is of equal significance to the major.[157] It is in this historical genesis of the numerical quantification of varying degrees of overtone complexity that we find within Partch's system an analogue to what Hindemith refers to as "harmonic fluctuation." The history of 'proportionality' as a means of creating a structural hierarchy from these degrees is implicit in the work of many theorists.

Dahlhaus contrasts Fétis' view of tonality with Hugo Riemann's theory of "affinities between tones" (*Tonverwandtschaften*).[158] Riemann's theory reduces harmony to the functions of what he calls the 'fundamental progressions,' embodied in the relationships between the tonic, dominant and subdominant degrees. This thesis stems from the assumption that all tones are implicitly or explicitly represent these basic structural degrees. Riemann's theory only admits of two basic chords, major or minor, which are the expressions of the "directly intelligible intervals." The scale itself forms a secondary phenomenon that is subsumed under the overall concept of tonality.[159]

> The tenacious relationship of all harmonies to the tonic has found its most pregnant expression imaginable in the designation of all chords as more or less strongly modified manifestations of the three main pillars of logical harmonic structure: the tonic itself and its two dominants.[160]

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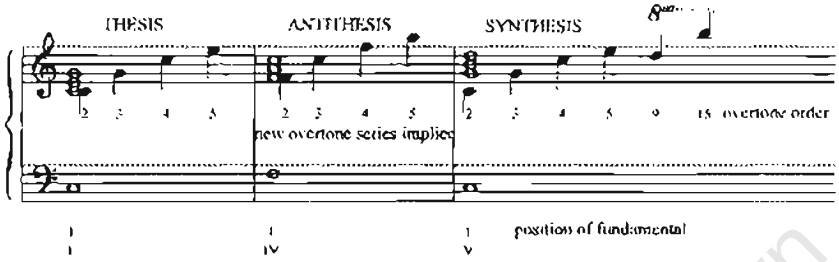
[156] Dahlhaus. *Tonality*, 8-9.
[157] Rameau. *Treatise*, 42.
[158] Dahlhaus. *Tonality*, 8.
[159] Loc. cit.
[160] Riemann in Dahlhaus. *Tonality*, 49.

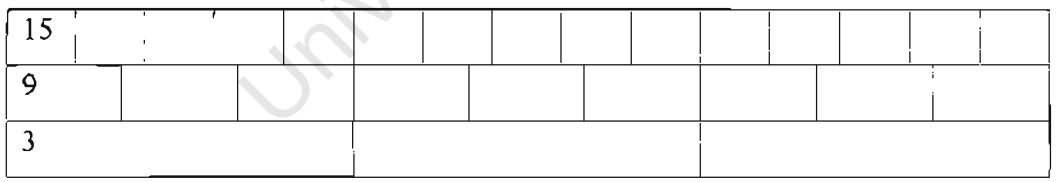
Riemann analyses this structure dialectically:

The first tonic is thesis, the subdominant together with the tonic six-four is antithesis, and the dominant together with the concluding root-position tonic triad is synthesis: the tonic is thetic, the subdominant antithetic, and the dominant synthetic.[161]



These functions are determined by the relationship of the chord to the overtone series of the tonic – either as antithesis or synthesis of the implied overtone structure of the fundamental – the tonic of a key. The forces of these two dominants – the under and the over dominant – render the tonic "internally divided" as both a dominant to the subdominant and a subdominant to the dominant.[162] The over dominant is a synthesis of the above progression because it reaffirms the status of the third overtone of the fundamental, by contradicting the implications of the subdominant's overtone series.

The following diagram represents one wave period of the 3-9-15 sonority:



One can see that the non-prime identities form smaller periods similar to the 1-3-5. Partch describes '9' is an identity like any other Due to these internal periods, however, it is evident that this is not the case, and that the non-primes can in fact be simplified in terms of other identities. 3-9-15 as a single wave period breaks down as a standard 1-3-5 implying *a new fundamental* as its first period attests. We thus find Riemann's

[161] Dahlhaus. *Tonality*, 51-52
[162] Ibid. 51.

progression by fifths by reinterpretations of the 9 and 15 identities; by interpreting them not as identities, but as what Partch calls multiple number ratios.

In ratio terms, the dominant represents the extension of C1-G3-E5, namely G3-D9-B15 The presence of the major subdominant triad (the antithetical chord in Riemann's dialectical functions), itself a F1-C3-A5 sonority, in a monophonic system (with one fundamental) means that the tonic triad must be reinterpreted as a C3-G9-E15. C's status as the root (tonic) of the C1-G3-E5-D9-B15 set of identities (I-V) is therefore negated in favour of the F1-C3-A5-G9-E15 (I/IV – V/IV) with F as the tonic or generating pitch. Only by introducing the G3-D9-B15 of C (the dominant) is a synthesis of the actual tonic of C major achieved. It is in the tension of this ambiguity, coupled with the affirmative quality of the dominant that Riemann sees the basic determinate of modern tonality

Because Riemann's harmonies are defined by their structural roles – by their reference to the three 'pillars' – one chord can be replaced by an equivalent without an alteration of function. For example in C major, F-A-C = S (Subdominant) and D-F-A = Sp (subdominant parallel) both tend away from the tonic's centricity, and are therefore both have equivalent value in the harmonic structure.[163]

Where Riemann's founding principle of tonality is in the structural qualities of the basic sonorities and the relationships formed between them, Fétis finds a theory in "the opposition between the dominant seventh chord and triad; between '*tendance*' and '*repos*.' These result from particular arrangements of the diatonic scale [164] Fétis refers to the organisation of this scale, saying that

[the] regulating principle of the relationships among tones, whether in the successive or simultaneous category, is generally designated by the name of tonality[165]

and that tonality is

[163] Ibid. 50.
[164] Ibid. 11
[165] Fétis in Dahlhaus. *Tonality*. 11.

a system of melodic and harmonic events that result from the arrangement of tones in our major and minor scales. [166]

Fétis' tonality functions as an organisational feature of the pre-formed scale, rather than being seen as the determinate of the scale.

Rameau's theory of tonality is similarly determined by relationships of tendency and repose.[167] His theory explains the role of the resolution of dissonances as creating[168] what he termed the "fundamental bass."[169] The fundamental bass differs from Riemann's structural functions in that they are particular instances (consonant bass movements between successive chords) of a more general phenomenon (the harmonic tension between dissonant chords and their resolutions). The theory of the fundamental bass relies on the theory of harmonic tension rather than vice versa.

Now nothing can better give the impression of a harmonic connection than the same tone which serves two successive chords, and which at the same time makes one desire the tone, not to say the chord, that ought immediately to follow.[170]

Rameau means that the archetype of the basic progressions is found in the correct preparation and resolution of dissonance:

[When] one says that it is necessary to prepare a dissonance, that means that the tone which forms it in one chord must have been part of the chord immediately preceding it. And when one says that it is necessary to resolve it, that means that it must have a definite progression of a type that we naturally desire, after having heard it. [171]

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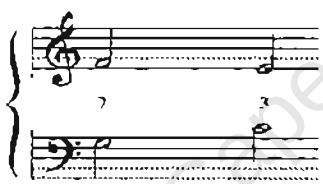
[166] Loc. cit.
[167] Dahlhaus, *Tonality*, 23.
[168] Ibid, 32.
[169] Ibid, 24.
[170] Rameau in Dahlhaus, *Tonality*, 34
[171] Loc.cit.

Rameau provides the model of the expression of a key and the connection of chords as "the sequence of seventh chords whose goal and conclusion is the *accord parfait* of the tonic." [172] This resolution of dissonance, and the "fundamental bass" that results determines chordal meanings.[173] Rameau's chords are therefore not linked by fundamental functions, but by the consonant progression of their roots – heard or implied by "musical imagination"[174] – which are linked and defined by the tendency resulting from the dissonances.[175] Rameau determines the single tonic of I-vi–ii-V-I by implied dissonances; the progression as a reduction of I-vi7-ii7-V7-I. Each implied seventh requires correct resolution onto the third of the next chord. Since this chord must then be a fourth above, the resolution of the dissonant seventh simultaneously results in a consonant bass movement



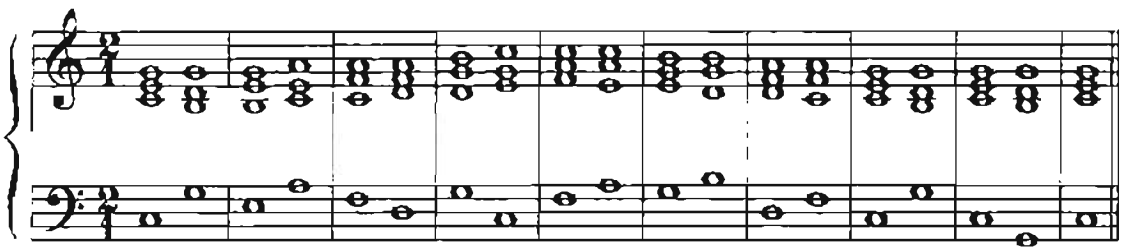
Rameau's theory differentiates between the fundamental bass and the thoroughbass (the actual bass tone).[176] The progression of chords is derived from the movement of this fundamental bass, rather than from the actual bass. This forms the 'fundamental progressions ' The root tone, located as the lowest tone in the stack of thirds, is the centre of Rameau's harmony and its definition is of pivotal importance.

The basis of harmony resides not merely in the perfect chord, from which the seventh chord is formed, but even more precisely in the lowest tone of these two chords, which is, so to speak, the harmonic centre to which all the other tones should be related. [177]

[172] Dahlhaus. *Tonality*, 35
[173] Ibid. 25.
[174] Ibid. 28.
[175] Ibid. 26.
[176] Dahlhaus. *Tonality*, 23.

[177] Rameau in Dahlhaus. *Tonality*, 23.

The following example from Rameau's *Treatise* demonstrates the fundamental bass of the chord progression in the upper stave:



The progressions of Rameau's chords are derived by the consonant progression of the fundamental bass of each chord.[178]

The fifth...should be considered the interval best suited to the bass...Thus, the entire progression of the fundamental bass should involve only [the fifth and the fourth which represents it.][179]

Furthermore, the fundamental bass can be seen to represent all structural significance of all the members of its chord. As a result, a chord with the fundamental sound in the lowest position is more consonant than an inverted chord where the root is in an upper voice; the 4:5:6 is therefore more consonant than the 5:6:8 even though the actual notes are the same.

Where for Riemann the I-vi–ii-V-I progression is unequivocally interpreted under a single tonic due to the structural relationships of dominant and tonic representatives;[180] every fundamental bass of Rameau's *perfect chord* is a potential tonic. In this way Rameau relies on *tendance* for the triad linkage; they are only expressions of a single key by virtue of their implied sevenths. While every perfect chord in Rameau's system is potentially its own tonic, this contingency is removed in Riemann's system because the tendencies of individual chords are subsumed under the overarching assumption of harmonic tonality.

[178] Rameau, *Treatise*, 207.
[179] Ibid, 61.
[180] Ibid, 27-28.

The utilisation of dissonance as a theoretical underpinning is taken even further by Paul Hindemith, who attempts to divorce measures of harmonic complexity (which he calls 'harmonic fluctuation') from the limitations of a reference to a diatonic or root movement context, and from the restriction of invertible chords built in thirds. He relies on the evidence suggested by the so-called acoustical laws of tones[181] (what Dahlhaus calls the "sensation of tone") contrasted with what for Riemann is a "conceptualisation of tone"[182] and for Fetis' is rather a "metaphysical law." (referring to an anthropological definition of musical sounds as specific to specific peoples).[183] Even Hindemith's scalar materials are derived by purportedly following

the suggestions which to the understanding ear lie hidden in the overtone series, [to] arrive at a simple and natural construction of the scale.[184]

Hindemith arrives at a classification of the degrees of dissonance possible by the various combinations of this "natural scale" and quantifies the sum of all its elements as a method for the composer. Hindemith understands intervals to be the primary level of musical sound – what 'Nature' provides. As a result, the characteristics of intervals give rise to a key, or the idea of a tonal centre, and not vice versa.[185]

Hindemith's theory rests on two "series." *Series I* classifies the melodic types of tonal relationships in reference to one fundamental tone, classed from the most consonant (the octave) to the least (the tritone)

The value of the relationships established in [this] series will be the basis of [an] understanding of the connection of notes and chords, the ordering of harmonic progressions, and accordingly the tonal progressions of compositions.[186]

[181] Hindemith. *Craft*, 71
[182] Dahlhaus. *Tonality*, 47.
[183] Ibid. 14.
[184] Hindemith. *Craft*. 33
[185] Ibid. 107
[186] Ibid. 56.

We shall henceforth call the significant order in which the twelve tones of the chromatic scale made their appearance, in diminishing degree of relationship to the given tone, *Series 1*.[187]

This significant order is the order of derivation from a fundamental tone, the more remote methods of tone derivation resulting in a more remote – and therefore more dissonant – relationships to the fundamental tone which is the tonic of a group of pitches.

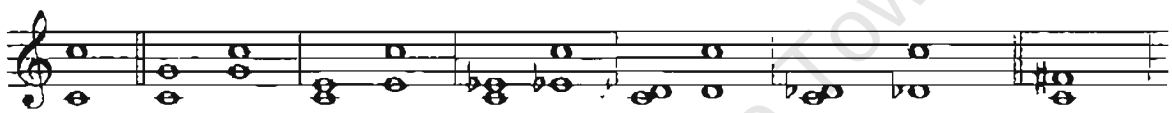
The first overtone of C (64 Hz) is the octave above the fundamental and the limit of Hindemith's scale. The third overtone G (192 Hz) is reinterpreted as a second overtone in a new series of overtones, which means that the fundamental is the G (92 Hz) one octave below forming the first new scale tone. Hindemith follows this procedure of reinterpreting overtone numbers to derive all the tones of his scale. If the same procedure is applied to the fourth overtone of C (256 Hz), and it is reinterpreted rather as the third overtone of a new fundamental – and therefore in a relationship of 1.3 to some lower tone - the tone F (85.33Hz) results as the tone a fifth below. The fifth overtone (E=320Hz) is taken as a third overtone, requiring a new fundamental of A (106.66). In this way each tone is treated as if it stands one or more tones lower in the overtone series than it actually does; the third overtone becomes the second, the second becomes the first and the fifth becomes the third, each reinterpretation being an implication – and therefore a 'generation' - of a new fundamental. The order in which these tones make their appearance during the process of tone generation defines their degree of relationship to the primary fundamental, and consequently their position in *Series 1*.

Hindemith defines chords as "extensions of intervals." Intervals and their juxtapositions give rise to tonicality and not vice versa[188] *Series 2* is a measurement of intervallic complexity; "a set of intervals without relation to a progenitor tone."[189] *Series 2* measures simultaneously sounding tones, not as relationships to a keynote, but as interval qualities of differing degrees of dissonance. These degrees are measured by the combination tones produced by the sounding of more than one tone. These define the 'natural order' of the

[187] Loc. cit.
[188] Hindemith, *Craft*, 107.
[189] Ibid. 84.

interval qualities, defined on a continuum from the most consonant to the most dissonant by the "immutable relation" between the directly produced tones and their combination tones. A clouding of the interval is attributed to these combination tones, a factor that Hindemith understands to be the definitive factor in the aural effect of degrees of dissonance. Hindemith believes that the composer can use a precise knowledge of this clouding of intervals as a means of more precise interval perception.[190]

While *Series 1* defines structural relationships in terms of a single tonic - the "progenitor tone" which defines their "tonal position"[191] - the gauge of harmonic tensions required for further expression of a tonal centre is provided by *Series 2*:



Hindemith's *Series* represent two fundamental approaches to categorising harmonic procedures: the tonal metastructure derived from melodic movements in relationship to a keynote, and the directional quality of "harmonic fluctuations" created by the juxtaposition of chords with varying degrees of dissonance (with no necessary keynote connection.) His theory contains an additional interpretation of tonicality to Rameau's while furthering the concept of harmonic tension without referring to the diatonic scale or triadic sonorities.

Partch's Tonality Diamond in *Genesis of a Music* rests on a similar assumption to Rameau's perfect chord. The sonorities of *repos* are the hexads of the 11-limit over and undertone series. For a theory of *tendance* the Tonality Diamond presents some interesting possibilities. As a structural tool one might see it as a synthesis of the inherent possibilities of Hindemith's two *Series*. It represents *Series 1* in that each of its twenty-nine tones is related to a fundamental in varying degrees of dissonance. The *Series 2*

[190] Ibid. 65.
[191] Ibid. 84.

significance for chords built in thirds is measurable by the constitutive ratios, the bigger the numbers the more distant the relationship is to unity.

Rather than quantifying the qualities of abstract intervals, as in *Series 2*, the Tonality Diamond's chordal resources are arranged similarly to *Series 1*, as a set of expanded 'major' and 'minor' chords with varying degrees of relationship to a 'progenitor' tone, unity or 1/1.

1) This relationship is defined by the relationship of each chord's roots to unity.
2) In addition to root relation there is the presence of unity itself in each chord, where each chord represents the reinterpretation of the chordal context of unity (i.e. the position of unity in the chord as the 'fifth,' 'root,' 'third' 'seventh' etc)

The root of the 11 Otonality chord, 16/11, is the 11th 'undertone' of 1/1 and the most dissonant undertone in an 11-limit resource. This tone is generated by 1/1 ÷ 11 = 1/11 = 16/11 (within the octave between 1/1 and 2/1). The root of the 3 Otonality is 4/3, the third undertone or perfect fifth below unity (1/1 ÷ 3 = 1/3 = 4/3.) The magnitude of the number generating a tone determines the value of its relationship to unity. This number is the 'identity' of the ratio in question. Since these tones are generated by *division* the identities are under numbers or odentities. An 11-limit Otonality can be built on the root 16/11. This results because the over number '16' is a potential 1 odentity, a potential '1' ingredient of the relationship 1:3:5:7:9:11 (as over numbers of a set of ratios or 'tonality.') The chord produced is represented by a set of ratios in the relationship of 1:3:5:7:9:11, where 1 is represented by the over-number in 16/11. This requires all the ratios of this sonority to have an under numerary nexus of 11

1/11 3/11 5/11 : 7/11 : 9/11 : 11/11

Expressed within the 2/1:

16/11 . 12/11 . 20/11 : 14/11 18/11 11/11

In this chord the 11 odentity is 11/11 (an new identity expression of 1/1), which defines the root relation in *Series 1* terms as in point 2) above. The position of 1/1 in relation to the root of chords is therefore a further indication of their tonal significance – their relation to a fundamental or tonicality.

The *Series 2* type chordal complexity is also measurable in terms of ratio size. The tonality hexad acts as a primary reference point. There are twelve of these hexads in Partch's Tonality Diamond, with two different identity groups; either 1:3:5:7:9:11 (Otonality) or 1/1: 1/3:1/5:1/7:1/9:1/11 (Utonality) and these can be expressed in different degrees of dissonance. The triad built on a 7 odentity - in the Tonality Diamond's equivalents of 'thirds' – as 14/11 18/11 : 11/11 (odentities 7:9:11) is a degree more dissonant than one built on a 5 odentity, 20/11 : 14/11 18/11 (odentities 5:7:9) due to the size of the odentities and their degree of remoteness from 1/1. Likewise (in *Series 2* terms) the 14/11 : 18/11 11/11 triad contains a more dissonant 1/1 than the same sonority built on a different root, for example 7/7 : 9/7 : 11/7 (odentities 7:9:11) where 1/1 is expressed as a 7 odentity.

The Tonality Diamond schema is still within Rameau's conception of the *perfect chord* and does not abandon the idea of 'chords built in thirds.' Hindemith's model attempts to surpass this 'limitation' by offering a means of measuring the structural meaning of any chordal complex created by the sum of any tones in the system. Partch's Tonality Diamond does however provide a rich variety of chords by absolutising the *perfect chord's* structural role, rather than subsuming it as part of another principle; for example the two *Series*. This results from overcoming other elements of the diatonic system, for example Riemann's functional limitations and uncovering new potentialities of the *perfect chord*. The sonorities that can be created as U- or Otonalities as expressions of any of the basic hexads in the Tonality Diamond read as follows:[192]

[192] Partch, *Genesis*, 123

The twenty triads

1-3-5	1-5-9	3-5-7	3-9-11
1-3-7	1-5-11	3-5-9	5-7-9
1-3-9	1-7-9	3-5-11	5-7-11
1-3-11	1-7-11	3-7-9	5-9-11
1-5-7	1-9-11	3-7-11	7-9-11

The fifteen quartads

1-3-5-7	1-3-7-11	1-5-9-11	3-5-9-11
1-3-5-9	1-3-9-11	1-7-9-11	3-7-9-11
1-3-5-11	1-5-7-9	3-5-7-9	5-7-9-11
1-3-7-9	1-5-7-11	3-5-7-11	

The six quintads

1-3-5-7-9	1-3-7-9-11
1-3-5-7-10	1-5-7-9-11
1-3-5-9-11	3-5-7-9-11

Hindemith employs a formula based on combination tones to quantify the tonal significance of an interval or chord. He defines the combination tones as

> the difference between the frequencies of the directly produced tones of the interval.[193]

Hindemith's combination tone formula can apply to single ratios in comparison to unity, in order to determine "the relative value of the intervals."[194] This value is attributed to the

[193] Hindemith, *Craft*, 61.

[194] Ibid. 68.

relationship between the combination tones and the directly produced tones of the interval or chord. Reinforcement or doubling of a directly produced tone by a combination tone is a characteristic of simpler relationships. If the combination tones add more tonal identities to the sonority it will naturally be more complex

According to Hindemith's schema, the combination tones arising from each tone of the 1 Otonality hexad in comparison to their root, 1/1 (128 Hz) are as follows (in contrast to Hindemith's system the ratio representations of combination tones are here expressed within the octave):

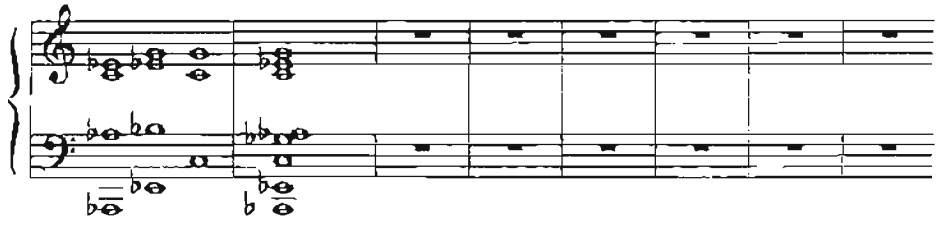
1/1 + 3/2 = 1/1(64 Hz)
1/1 + 5/4 = 1/1 (32 Hz)
1/1 + 7/4 = 3/2 (96 Hz)
1/1 + 9/8 = 1/1 (16 Hz)
1/1 + 11/8 = 3/2 (48 Hz)

In comparison, the 1 Utonality hexad produces:

1/1 + 4/3 = 4/3 (42.66 Hz)
1/1 + 8/5 = 6/5 (76.8 Hz)
1/1 + 8/7 = 10/7 (18.28 Hz)
1/1 + 16/9 = 14/9 (99.55 Hz)
1/1 + 16/11 = 20/11(58.18 Hz)

Although Partch's Otonality hexad gains support by Hindemith's theory of combination tone dissonance, the tones of the Utonality are seen to be supported by combination tones which occur in the individual tone's Otonality forms; rather than acting as a support, the combination tones 'cloud' the Utonality hexad. For example the euphonic status – and therefore structural priority – of 8/5 is strengthened by a 6/5 combination tone, which represents a 3 odentity in the 3 Otonality, supporting the 8/5 as a 1 odentity in the 3 Otonality rather than a 5 udentity in the 1/1 Utonality.

Although Hindemith's theory employs combination tones as a determinate for the 'harmonic value' of intervals and chords, he allows that they present an "unfavourable" picture for the minor triad [195]



In fact a combination tone analysis of the minor triad does not seem to support the structural significance attributed to it in all the theories considered here, from Rameau, Riemann and Hindemith to Partch. Hindemith's response is to describe the minor sonority as a "clouding of the major triad."[196]

> Since one cannot say definitely where the minor third leaves off and the major third begins, I do not believe in any polarity of the two chords. They are the high and the low, the strong and weak, the light and dark, the bright and dull forms of the same sound.[197]

Rameau's primary intervals (primary consonances) are defined by their relation to their fundamental and cannot be justified by secondary means of tone generation, as resulting from the distance between two primary intervals. Consonances must be derived directly from the fundamental if they are to be considered primary. Rameau does not postulate minor to be the inversion of major – as do Riemann and Hindemith – but he does claim that "all the diversity of harmony is indeed based on inversion" this inversion being inversion by the octave[198] (i.e. harmonic rather than melodic inversion). Rameau's primary consonances are the fifth and the two thirds,[199] those intervals which are directly

[195] Ibid. 75.
[196] Ibid. 78.
[197] Loc.cit.
[198] Rameau. *Treatise*. 15

[199] Ibid. 16

related to the fundamental; the fifth between 2 and 3, the major third between 4 and 5. The minor third, actually occurring between the overtones 5 and 6 needs fairly drastic readjustment if it is to support Rameau's theory of consonance.

we should make it clear that we use the ratio of this minor third between 5 and 6 only so as to avoid fractions and to confirm the natural order of numbers...This ratio could be given the same proportion between 1 and 1 1/5, and the unit would then be the source.[200]

Rameau's system seeks to separate consonances from the other tones of the scale, and this is justified, like Hindemith's *Series I*, by their level of appearance. The consonances are 'primary' because they are directly generated tones. The perfect fourth is a 'secondary consonance' because it occurs between the third and fourth overtones and is therefore generated by inversion of the fifth, by comparing the third overtone to the octave (3:4). Should the minor triad be explained as being produced of the fifth overtone, it would have a similarly secondary harmonic significance to the fourth. Rameau's reorganisation of the terminology - reinterpreting the 5:6 proportion with fractions as 1:6/5 - is a somewhat weak attempt to bring his musical reality within the confines of his theoretical structure. Naturally this reinterpretation can be afforded to all intervals, as any interval can be seen to be some division of the fundamental sound; and this is the argument for monophonic tone generation. The implications of this reinterpretation are not followed through by Rameau: namely that the fourth can be explained as 1: 4/3 and can therefore also have the status of a consonance. If the same is true for every tone in Rameau's system, his distinction between consonance, secondary consonance and dissonance fails in terms of a consistent theoretical grounding.

Rameau wrote that

[the] only difference [between the minor and the major triad] is in the arrangement of the thirds from which the fifth is formed. The third which had been major on one hand becomes minor on the other: the sixths which arise from them behave similarly. The foundation of the harmony,

[200] Loc.cit.

however, does not change at all. On the contrary, the beauty of this harmony is that the major and minor thirds are equally pleasant.[201]

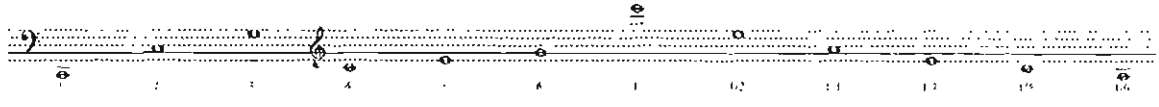
We do, however, gain a good illustration of two different interpretations of the ratio: Rameau's hierarchically fixed system and Partch's centrically organised continuum. In addition one finds two theoretical reinterpretations in the difficulty of the minor third: Hindemith's 'clouding' and Rameau's numerical sleight of hand.

Riemann's solution to the problem of the minor triad draws on the theory of Arthur van Oettingen, "the founder of 'dualism' in harmonic theory."[202] Riemann bases the minor triad on the undertone series and the major on the overtone. His theory rests on a basic notion of consonance:

The verdict of the ear declares those intervals the simplest...which mathematics and physics reduce to the simplest numerical ratios.[203]

By "mathematics" Riemann refers to the relationships between tones defined by numerical relationships (on which an undertone series must be based), while "physics" refers to the overtone series, which is also explained by the same numerical relationships. Partch's theory, although based on the same principles as the overtone series, soon leaves it behind in favour of the more diverse applications of ratio theory.

These ratios represent either tones from a lower tone or tones from a higher tone. The following intervals result (taking first C as 1 and then E as 1):



[201] Ibid. 42.
[202] Dahlhaus. *Tonality*, 52.
[203] Riemann. *Treatise*, 2.

These tones represent the "two series of notes having *the closest harmonic relation*" and are what Riemann refers to as "the so-called overtone series and undertone series."[204] These two series are thus derived because of their harmonic relation, rather than being plucked from any pre-existing natural tone series. Riemann's theoretical concern is the consideration of "perception by hearing" as more important that physical grounds because of his focus on the *rational* organisation of tone ("the conceptualisation of tone" resulting from "the sensation of tone") rather than the mere physicalities of tones as they are purported to exist in the 'natural' world.[205] Riemann thereby arrives at the following two primary chords: the major (overclang[206]) and the minor (underclang), and the justification - by interval complexity - of the two possible tonics of the diatonic scale, "the natural melodic scale."[207]

For Partch the musical significance of Utonalities are a product of the facts of interval perception, a theory that he derived from Helmholtz's studies of the ear He dismissed the importance of both combination tones and the undertone series as of little or no importance in the face of 'simple aural fact':

Hindemith dismisses the acoustical justification of minor as a derivation from the undertone series, but does admit that the minor series of pitches arises by a simple process of inversion." This simple inversion is evident in the symmetrical structure of the Tonality Diamond and in the relationship between U and Otonalities. The method of inversion that Partch employs in the construction of the monophonic fabric is of significance in the classification of over- and underclangs This can be clearly seen by a comparison with Rameau's theory of inversion by the octave, which is somewhat responsible for Rameau's problem of major and minor.

[204] Ibid. 3. (italics mine)
[205] Ibid. 2
[206] Here I use Bewerunge's translation of Riemann's "überklang."
[207] Riemann, *Harmony*, 5.

Due to the similarity of a tone to its octave - the upper note of the octave to the lower – Rameau treats the octave – the 2/1 - as a "second term"[208] (referred to as inversion by the octave) for the process which generates the intervals. Everything generated by the division of the source (1/1) can therefore also be compared to the octave of this source (2/1).

In the relationship 2:3:4 (C:G:c), 2:4 represents the octave and 2:3 represents the just perfect fifth (3/2). Rameau employs the octave, 4, as a "second term" and measures a new interval *between* 3 and 4 (G:c) as the 'perfect fourth' (4/3). Because '4' is a "second term" Rameau interprets the fifth as a primary interval, while the fourth is secondary, "nothing more than the transposition of a lower sound to a higher position" or 'inversion by the octave.'[209] The fourth or 4/3 is therefore a derivation by the octave inversion of 3/2. Consequently it is not a primary consonance.

Partch's understanding of the ratio results in a fundamentally different perspective, and similarly a contrasting function of inversion itself. Because Partch understands all ratios to be "expansions from unity", his method of inversion results not only, like Rameau, in a new interval, but also directly in a *new tone*, a new sound with its own relationship to unity. Monophony's inversion of 3/2 is not inversion by the octave, but by the geometric inversion of the ratio: 3/2 is inverted and becomes 2/3. In alphabetic terminology this results in the F *below* C or 2/3:1/1. Two 'fifths' result an 'over fifth' by multiplication of 1/1 by 3/2, and an 'under fifth' by multiplication of 1/1 by 2/3, and with these result two new tones. Both fifths are directly derived from 1/1, as are all the tones of the Tonality Diamond, rather than being separated into 1) those that are related to the fundamental (primary consonances) and 2) those that are not (secondary consonances and dissonances). Rather than adhering to a fixed view of tones in the overtone series like both Hindemith and Rameau, Partch measures all intervals *from* the fundamental.

[208] Rameau. *Treatise*, 10.
[209] Ibid. 9.

As a result of this different approach in intervallic construction, the minor third in its harmonic function is 8/5 or 1/1 ÷ 5. This is the proportion 8:5 as the under minor, rather than Rameau's 5:6 which is the over minor as explained above. This over minor – the minor *above* the fundamental - is the 3 odentity in a 5 Otonality as:

Odentity: 1 : 3 : 5 : 7 : 9 : 11
Ratio: 8/5 : **6/5** : 5/5 : 7/5 : 9/5 : 11/10

The minor third 5/5 : 6/5.

This is opposed to the minor third below unity:

Udentity: 1 : 3 : 5 : 7 : 9 : 11
Ratio: 1/1 : 4/3 : **8/5** : 8/7 : 16/9 : 16/11

The interval of a minor third, rather than the quality of minor tonality, occurs between 4/3 and 8/5 – between the under 'fifth' and the under 'third.'

Conclusion: An Argument for 31-tone Equal Temperament

Harry Partch's diamond, because it is of monophonic genesis, only finds the 11-limit Otonality on six of its 28 tones. Therefore within the conceptual confines of the diamond one finds that it is impossible to create a fundamental progression of 3/2's, the basic progression of Rameau's fundamental bass, which relies on multiple fundamentals. Likewise one finds limited possibilities for fundamental root progressions using primes higher than five. Though the diamond does explore the possible harmonic senses of a single fundamental (as the root, third etc), it provides no means of freely traversing linear pitch space. Thus the logical consequence of the extension of vertical pitch, which is the extension of linear pitch space or tonal progressions, cannot be achieved within Partch's monophonic system. This horizontal movement *between* chords is, however, also measurable according to Partch's quantification of consonance and dissonance in vertical pitch structures. Thus Rameau's fundamental bass movement of 'fifths' provides the horizontal expression of Partch's three-limit *perfect chord*. A music incorporating the tonal 11-limit can further utilise this means of chordal progression; both as a means of measuring the complexity gradations of different chordal *progressions* and to measure the comparative dissonance of vertical expressions. This technique is used in the music of Tenney as noted by Bob Gilmore, writing on *Changes: Sixty-Four Studies for Six Harps* (1985) which uses a 72-tone equal temperament:

"In determining the harmonic space for *Changes* Tenney decided to assume an eleven-limit for the modes ... a seven-limit for root progressions and to make the closing cadential movement in each study move . . by descending fifths."[210]

Partch's theory allows for quantitative harmonic fluctuation in Hindemith's sense, but does not allow for the expansion of Rameau's root movements This is due to the closed system of relationships embodied in the Tonality Diamond. Partch's theory therefore has little to do with the *functional* sense of consonance and dissonance in musical terms. Like

[210] Gilmore, "Metaphor," 491.

[Helmholtz's] theory [Partch's] has "nothing to do with... motion, resolution, or chordal connections of any kind. It refers merely to the perceptual character of individual chords."[211]

A 31-tone equal temperament (31-tet) provides an interesting solution to the problem of tuning an instrument of fixed tones to include higher partials such as the seventh and the eleventh overtone. Furthermore it provides a practical means of reconciling Rameau's ratio scale root progressions with Partch's ratio scale chordal structures.

31-tet, like its twelve-tone equivalent, divides the octave (1200 cents) into equal parts Description of this system occurs in the writings of Christiaan Huygens (1629-1695) and, more recently, in the writings of Adriaan Fokker (1887-1972) as well as numerous other early and modern theorists [212] The theory of 31-tet occurs as an expansion of meantone tuning, the standard tuning of the harmonic era before Bach's time. A cycle of four Pythagorean fifths (C-G-D-A-E) make a major third 21.506 cents or a *syntonic comma* sharper than the 'just' major third (5/4). Meantone tuning therefore tempers each fifth from the C-E cycle above by one fourth of this comma so as arrive at this 'just' major third. The fifths in meantone tuning are thus each flatter than a 3/2 by 5.38 cents.

This cycle of meantone fifths does not close, as does the cycle of equal tempered fifths where B# equals C and there are enharmonic equivalents. The cycle of eleven meantone fifths arrives at a tone 41 cents flat of the first tone in the cycle when brought within the same octave. If, however, the circle is made of 31 meantone fifths, the interval of difference to the eighteenth octave is only 6 cents. This six cents can easily be distributed among the 31 major thirds,[213] meaning that just each just third must be flattened by only 0.195 cents. The process looks as follows:

Just fifth 701 955 cents x 4 = 2808.820 – 2 octaves (2400 cents)

= Pythagorean M3 407.820

[211] James Tenney in Gilmore "Changing the Metaphor," 490.

[212] According to Rapoport, the first 31-tone keyboard was built by Nicola Vincentino (1511-1572), while Fokker commissioned a 31-tone equal temperament organ in 1950. (Rapoport "About 31-tone equal temperament ")

[213] The process also effects the fifths, each one being tempered by the same process.

407.820 – just third 386.314 = syntonic comma 21.506

21.506 ÷ 4 = 5.377

Just fifth – 5.377 = meantone fifth 696.6

696.6 x 31 = 21593.931 (almost eighteen octaves or 21600)

21600 – 21593.931 = 6.069

6.069 ÷ 31 = 0.195

just major third 386.314 – 0.195 = 31-tet major third 386.119.[214]

The result is an expansion of meantone tuning, but with a closed circle of all intervals, allowing free movement through all keys on an instrument with fixed tones.

The resulting pitch fabric has the following steps that closely resemble Partch's 11-limit perfect chord:

31-tone in cents	'just' ratio in cents	'just' in cents	12-tone equivalent
0	1/1	0	0
387.1	5/4	386.3	400
541.9	11/8	551.3	-
696.8	3/2	702	700
967.7	7/4	968.8	

One can see that even the tone with the largest divergence from 31-tone equal temperament, the eleventh overtone, is only 9.4 cents flat.[215] The major thirds are almost perfectly in tune, as is the seventh overtone.

Gilmore writes of American composer James Tenney (who worked with both Partch and John Cage):

[214] Rapoport, "About 31-tone equal temperament," 1.
[215] One must remember that the major third in 12-tone equal temperament is 13.7 cents sharp.

Tenney invokes the mechanism of *tolerance*, familiar from cognitive psychology, which holds that – within a certain *tolerance range*, or range of frequencies – some slight mistuning is possible without altering the harmonic identity of an interval... Although the ratio model implies an extended just intonation system, he has in specific compositional contexts accepted tempered systems, as approximation, as viable ways of working. His use of the ratio model of pitch differs in this from Partch and Johnston.[216]

31-tet tuning encompasses Partch's expansion of the tonal system within a minimal tolerance range. But because the pitch fabric is made up of equal steps, any set of identities that can be built from one tone can be built from any of the other 31 pitches. This means that fundamental root progressions up to the eleventh prime can be explored between 31 potential fundamentals.

For the realm of harmonic centricity to remain a viable option, rather than an endgame, Partch's legacy remains to maintain *conceptual* clarity. This clarity is vital, and as argued with regard to notation above, relies on the composer's means of accessing the sounds at his disposal. If we accept Tenney's principle of tolerance, the implication is that a conceptual map can maintain its definition even in the face of the inexact representation that is often necessary on instruments with fixed tones. The fact that this clarity is maintained is evident in the fact that the basic tonal model of pre-nineteenth century music remains intact and perceivable even though it is not accurately represented in the twelve-tone tempered system. Thus while 12-tet provides adequate representation of the centric resources of a five-limit ratio scale, we find that 31-tet adequately represents the same centricity up to the seven-limit and, arguably, as far as eleven.

The exploration of a temperament such as 31-tone can remain within the concept of monophony as a compositional system, while adding the potential to access chords or tonalities outside of those defined by the diamond. The possibility of multi-octave modular scales or similarly ambiguous interval-scales, or of serial procedures, is further included in the compositional potential of the 31-tone fabric. It remains, however,

[216] Gilmore, "Metaphor," 486.

important to clarify the distinction between map (just intonation) and territory (equal temperament). This distinction remains intact in Western music until the break with tonality, a break which is capitulated by the greater exploration of enharmonic ambiguity in the music immediately preceding this break.

The use of modulation or chord resolutions relying on the ambiguity of note spellings, occurring as a tonal/harmonic resource from the Baroque onwards but reaching its full potential in the late nineteenth century, is - in terms of Johnston and Partch's just intonation - a misrepresentation of the centrically organised conceptual system which twelve-tone equal temperament represented in its original form. When the step away from enharmonic differentiation is made, the bonds to just intonation or ratio-scale centricity as a conceptual system are broken, and in its place lies a fuller exploration of what Johnston calls 'scalar order.' This exploration takes place both with reference to ratio scale sonorities[217] and, later, outside of this framework in so-called atonal music.

The utilisation, most notably from the nineteenth century onwards, of notational and tempered ambiguity as a conceptual tool signals a move towards a new *langue*. Thus a move into further abstraction occurs through the investment of an abstract or idealised realm with new creative potential. The syntax of the enharmonic becomes one of the primary features of late-Romantic music. The syntax defined by ratio scale organisation, predominant in pre-Romantic harmonic practice, begins to be loosened at this point, giving way to the expressive potential of the reinterpretation of pitch classes. This statement is better understood from the point of view of Johnston's analysis of twelve-tone music:

[What happens] when a good string quartet...performs a non-tonal work, especially if the piece contains a large proportion of simultaneous pitch combinations, is an inflection of each pitch according to its context. Thus, in practice, there are not twelve *notes*, but twelve *pitch regions* per

[217] The functional context of late-Romantic harmony does, however, *imply* enharmonic distinctions even on an instrument which can only represent generalised "regions."

octave. Twelve-tone organisation leaves this refinement unspecified, and twelve-tone theory has no place for it. [218]

Furthermore, the most consonant interval is not

"the *average* interval size provided by equal temperament, but the most consonant interval within the size class called for, the exact pitch determined by the pitch context."[219]

Thus connection of chords by enharmonically common tones is rather the connection of chords by common pitch *regions*, the generalised region stipulated by tempered versions of an actual pitch. An 'A,' for example, tuned from D 9/8 in C major is tuned at 905.9 cents or 27/16, while the 'A' tuned from the F 4/3 in C major is 884.3 cents or 5/3. The *comma difference* of 21.7 cents (approximately a fifth of an equal tempered semitone) is averaged out in equal temperament, both notes being approximated by the *region* represented in 12-tet as 900 cents. It can therefore be seen that enharmonic modulation implies a theoretical concretisation of what had initially been the means of abstract representation (notation) and realisation (twelve-tone equal temperament).

This initial step is fully realised and, by Adorno's criterion, *critiqued*, in the music of the Second Viennese School. Schoenberg and his followers provide the first *honest* critique of the idealist cul-de-sac by taking the idealist *langue* to its absolute conclusion in their move into an unequivocal system of interval scale ordering. Theirs is the final *acknowledgement* that the 'map' of temperament and conventional notation has been taken beyond its own limits, and that a misplaced concreteness has resulted in the decay of the original object i.e. free harmonic use of all keys. With their critique comes the utilisation of centric *ambiguity* as a compositional device, a direct consequence of the increasing impossibility of fixing the exact pitch class denotation (context) of a notated or equal tempered pitch. Furthermore, the abstract model of the twelve-tone series replaces the unifying function of centric pitch systems.

[218] Johnston, "Proportionality," 115.
[219] Loc.cit.

Schoenberg's view of his position, and perhaps his inability to see its wider social implications, consolidates the abuse by later generations of his *artistic* and *critical* act. While progressive theories do have momentary potential to transcend previous dogma, they do this only by proposing a new order. It is here that the *huis clos* remains: both the given language and the language of criticism have the potential to act as a prison, and the latter is potentially the more misleading in its affirmative physiognomy

It has been suggested here that the process of demythifying musical discourse arises out of the illuminative capacity of the blind spots within individual musical theories. As shown by the music of composers such as Partch and Schoenberg, as well as the writings of Adorno and others, it can be seen that this process is one which occurs as a result of the necessity to renew a reified culture, and that this renewal comes about as a result of crisis. Furthermore it has been suggested that significantly more inclusive theoretical notions must be developed: that, if art requires a critical self-reflection, a theory of art must equal this challenge

On a practical level this dissertation has explored the validity of expanded just intonation as a means of carrying out the above programme, both in the realm of compositional theory and, implicitly, in that of analytical theory It has presented the possibility of applying a model of proportionality as a structural description of traditional harmonic tonality, and used this tool as a means of synthesising the general characteristics of Partch's theory with that of more traditional approaches to harmonic and notational practice. The result of this abstract model is a theory of composition which has the potential to act from within contemporary musical discourse. Critique does not therefore, as initially seems to be the case with Partch, result in alienation from the mainstream, but rather addresses the latter's central issues by developing an immanent relationship to its theories, and revising those aspects of its theories which exist only as a second nature writing of history. Partch's corporeal philosophy takes on, therefore, a wider musical significance, exemplifying a theory that, in the last analysis, remains consonant with the artistic discourses of the twentieth-century

Addendum 1: Harry Partch's Ratio Theory

Partch describes the ratio in *Genesis of a Music* as:

a relationship, or interval, expressing the vibrations per second, or cycles, of the two tones concerned, generally in the lowest possible terms [...] a ratio represents a tone and an interval at one and the same time; in its capacity as a symbol of a tone it is the over number that is nominally representative (in the upward manner), but since the over number exists only in relation to the under number, the ratio acquits its second function, as representative of an interval; conventional musical example: 3/2 represents "D" in the key of "G"; it is thus simultaneously a representative of a tone and an implicit relationship to a "keynote"[222]

All ratios in the Monophonic system are representative of a quantity between 1 and 2, between the fundamental and its octave. This fundamental tone is represented by '1' which, as a ratio, is 1/1 or 'unity.' Partch describes Monophony as:

an organisation of musical materials based upon the faculty of the human ear to perceive all intervals and to deduce all principles of musical relationship as an expansion from unity, as 1 is to 1 – or as it is expressed in [*Genesis of a Music*] – 1/1 [223]

All tones of Monophony are derived directly from one fundamental tone, and are all considered to be direct expressions of this tone's potential to be expressed harmonically; i.e. as a 'third' or 'fifth' etc of a chord.

Tones in a relationship of 1:2 – or with the generating number 2 - have a similar identity Rameau writes that "male and female voices naturally intone the octave, believing themselves to be singing in a unison or the same sound "[224] For this reason Partch chooses to bring all ratios within the same octave so as to limit the amount of necessary signs. The ratio 2/3, a perfect fifth below 1/1, is transposed up an octave to 4/3, placing it

[222] Partch, *Genesis*, 73
[223] Partch, *Genesis*, 71
[224] Rameau, *Treatise*, 8.

in the octave occurring between the integers 1 and 2. In this way all tones have only one ratio representative

Gradations of dissonance are analysable by number: the smaller the numbers constituting a ratio, the less the complexity and the greater the consonance of the musical interval it represents. 11/8 is therefore more dissonant than 5/4 and 5/4 more than 3/2. Maximum consonance is complete numerical agreement or unison: 1/1, where vibrations are in the relationship of one to one.

Monophony's primary generative concept is the expansion of the tonic chord of traditional tonality using higher tones of the overtone series in conjunction with a theoretical undertone series. Tone is vibration. Different tones are different tempos of vibration. The vibrations of the 'major' triad are in the proportional relationship of 1:3:5

if we stipulate three different identities of a chord these three give the maximum consonance.[225]

Thus for every one vibration of the fundamental tone, the other two tones vibrate 3 and 5 times respectively (An increase in the amount of vibrations per second results in a higher pitch.) These three relationships are the three "identities" that define the sonority of the major triad; generated by the multiplication of 1/1. These are the three most consonant relationships from the fundamental of an overtone series, and therefore are represented by the three smallest numbers. The prime numbers of the overtone series (increasingly larger numerals) become exponentially more dissonant as their order-number increases The expansion of the tonic (major and minor) triads of traditional tonality up to the eleventh overtone results in a consonant six-note chord or hexad These expanded sounds are not represented in equal temperament.

Partch's concept of 'tonality' may be understood as 'similarity' A tonality maps the similarities between a group of different tones. The triadic conception of tonality groups

[225] Partch. *Genesis*. 111

together tones with differing identities by using a factor common to all three, by finding their 'sameness'.

the fact of tonality is the fact of maximal consonance for a stipulated number of different identities.[226]

Monophonic tonalities are defined by those ratios which have either an 'under' or an 'over' number in common, so as to belong to a similar tonality. This common number is called the numerary nexus,

the number common to all identities in the ratios of one tonality - the common anchor; the characteristic of a series of ratios that determines them as a tonality.[227]

Hugo Riemann described the minor triad as the mirror image or inversion of the major. In this sense Partch represents the minor triad by the same identities as the major, yet descending in pitch from the fundamental 1/1, now *divided* by identities 3 and 5.

Partch distinguishes between the major and minor triads by the position of their identities in the ratio of a chord. The defining features of a major triad are its 'odentities,' the 'over' numbers of the ratios representing its tones. Therefore: 1/1 3/1:5/1 = 1/1 3/2:5/4. Minor tones are 'udentities' with 'under' number identities: 1/5:1/3.1/1 = 8/5:4/3:1/1

Consequently, all ratios contain a dual harmonic (identity) potentiality and can be read in two senses: 1) as a member of an Otonality series of pitches with an under numerary nexus, and 2) as a Utonality with an over numerary nexus.

5/3 can therefore be the 5 odentity or 'third' of a major triad thus

[226] Ibid. 159.
[227] Ibid. 72.

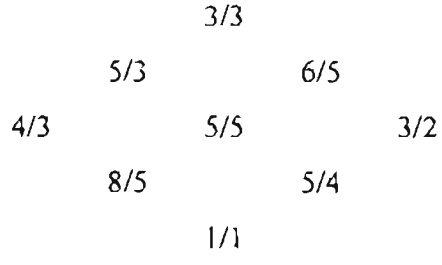
4	3	**5** = odentity
3	3	**3** = numerary nexus
F	C	A

or the 3 udentity or 'root' of a minor triad:

5	**5**	5 = numerary nexus
5	**3**	4 = udentity
C	A	E

Most important to the construction of the Monophonic fabric is the reinterpretation of unity's identity status. 1/1 can represent all identities of the Monophonic system. As a 3 identity it is 3/3, forming both a potential 3 odentity (by the over number) and a 3 udentity (by the under number). As a 5 identity it is 5/5. In the above examples, 1/1 is a 3 odentity (3/3) and a 5 udentity (5/5) respectively. The latter ratios represent the same musical tone as 1/1 – the same pitch – the only difference is the identity status; the position in a chord. In its different expressions 1/1 will belong to different tonalities as it is expressed in its potential to be reinterpreted as all identities of the system of which it is the generating tone

Each of the generative numbers of the 5-limit (ratios comprising numbers up to and including 5) is taken in this way, as either the under numerary nexus in an Otonality, or the over numerary nexus in a Utonality. These are the realisations of the six potential identity interpretations – or positions in chords - of unity available within the 5-limit By completing the triads implied by the three identities of unity as 1/1, 3/3 or 5/5 in both over and under senses, Partch arrives at the Incipient Tonality Diamond representing the "coexistence of 'major' and 'minor '"[228]



[228] Ibid. 110.

THE INCIPIENT TONALITY DIAMOND

C

A Eb

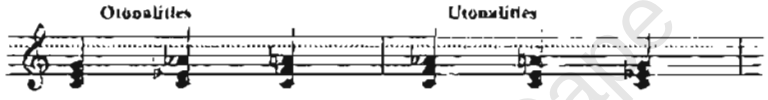
F C G

Ab E

C

(Otonality triads are read diagonally upwards and utonalities are read diagonally downwards as 1:5:3 and 1/3:1/5:1/1 respectively.)

These ratios are "implied" in the following tones of equal temperament:



By 'implied' we mean that the ear jumps the distance between what it actually hears and what it wants to hear.[229]

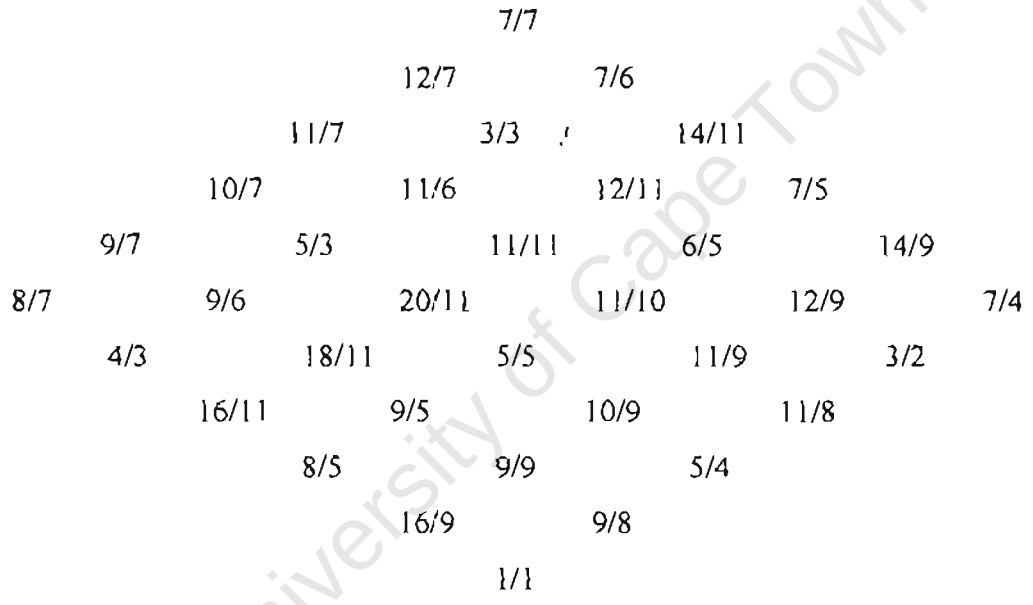
From 1/1 = 'C' in equal temperament:
The 'minor third' ('E flat') is 15.6 cents sharp
The 'major third' ('E') is 13.7 cents flat
The 'perfect fourth' ('F') is 2 cents flat
The 'perfect fifth' ('G') is 2 cents sharp
The 'minor sixth' ('A flat') is 13.7 cents sharp
The 'major sixth' ('A') is 15 6 cents flat

The two tonic sonorities of traditional tonality, the major and the minor chord, are thus subsumed into the Monophonic system as the primary means of generating the pitch resource. From the evidence of the 5-limit identities, Partch finds the general principle of

[229] Ibid. 109.

harmonic stability – or tonicism – and expands this idea up to the eleventh partial or 11-limit. The result is two tonic sonorities, comparable to major or minor triads, comprising six tones each. These hexads represent the identities 1:3:5:7:9:11, descending and ascending in pitch from 1/1.

The full 11-limit tonality diamond exhibits 1/1 in all its potentialities, expressed as all identities in six 'major' hexads and six 'minor.' This hexad is the maximum consonance obtainable with six identities of either an Otonality or a Utonality.



THE EXPANDED TONALITY DIAMOND

In this way Partch arrives at a division of the octave into 29 unequal parts, each of which, expressed as a ratio from 1/1 is derived from the logic of the tonic 'major' or 'minor' triad within the expanded realm of 11-limit just intonation.

Addendum 2: 'Proportionality' in Carnatic Rhythmic Theory

Carnatic percussion theory makes diverse rhythmic use of an 'identity' theory Rhythmic phrases and pulse speeds are analysable by rhythmic relationships, as can be seen in S.Rajagopala Iyer's exhaustive study of the proportional applications of Carnatic theory,[230] although he does not explicitly refer to proportionality as such or even to gradations of dissonance.

A *Jathi* ('J') is the basic length of a rhythmic unit (phrase), or the numerical "description of the length of solkattu (phonetic syllables) or drum patterns."[231] There are five basic patterns:

Chatusra jathi: J4
Tisra jathi: J3
Khanda jathi: J5
Mishra jathi: J7
Sankirna jathi: J9

These are expressed in *Solkattu* (*sol* = syllable, *kattu* = group), where each syllable corresponds to a sound on a percussion instrument. The percussionist learns all rhythmic compositions verbally before transposing onto an instrument. Iyer gives an example of the vocalisation of the Jathis as:

1	Ta	T
2.	Taka	Tk
3.	Takita	Tkt
4.	Takadhimi	Tkdm
5	Takatakita	Tktkt
6	Takatakadhina	Tktkdn

[230] Iyer, *Tala Calculations*.
[231] Sankaran, *Principles*, 161.

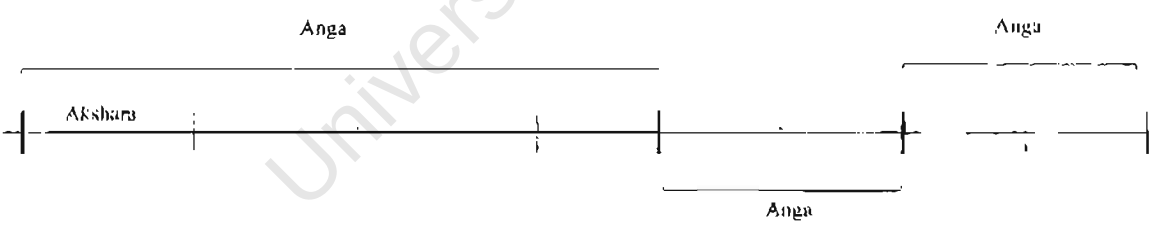
7.	Takitatakadhina	Tkttkdn
8.	Takadhimitatadhimi	Tkdmttdm
9.	Takadhimitadinghinathom	Tkdmtdgnt
10	Takatakitatadiginathom	Tktkttdgnt

All rhythmic events in Carnatic music are organised according to cycle called the *tala*. The tala has a similar musical significance as a time signature (or a regular phrase length in some time signature), but is of a significantly more complex construction. This basic rhythmic cycle acts as an implicit structure, remaining unchanged throughout an entire composition.

The tala is a time measure for containing musical composition so as to give regular rhythmic effect throughout the recital. [232]

The tala is divided into 'bars,' called *Aksharas* ('A'). [233] An *Anga* is a group of Aksharas, dividing the tala into larger parts [234]

One Tala Avarthanum (cycle) comprising 8 Aksharas and three Angas (The Anga



divisions are of different lengths, one of 4 bars and two of 2 bars)

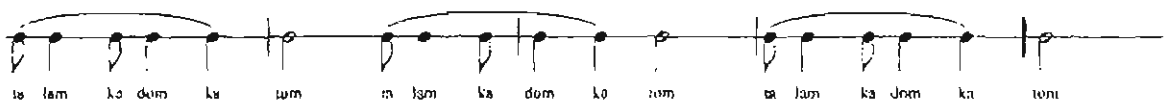
Fig. 1

The jathi is the actual "speech" occurring within this structure. It delineates the tala by moving 'over the unimportant bar-lines to accentuate the strong beats. Accentuation in Carnatic music is not achieved by stressing the first beat of a rhythmic phrase, but rather

[232] Iyer, *Calculations*, 3.
[233] Sankaran, *Principles*, 14.
[234] Loc. cit.

by constructing groups of jathis that end on the first beat of the Tala. Rhythmic thinking is therefore always *towards* strong beats:

Fig. 2

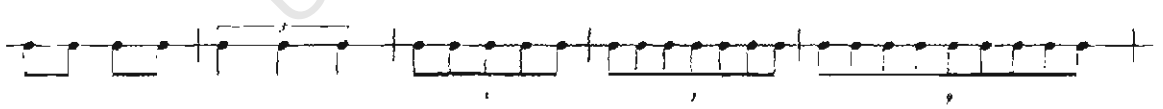


Nadai or *gathi* ("Gait") indicates the number of subdivisions of an Akshara.[235] The Gathi is the Sanskrit term for "the rate of speed or movement."[236] This is the rhythmic pulse by which the *tala* is expressed. These fractional parts or inner units of an akshara are known as *mathra*.[237] There are five traditional *nadais*:

Chatusra nadai = 4M per Akshara
Tishra nadai = 3M per Akshara
Khanda nadai= 5M per Akshara
Mishra nadai = 7M per Akshara
Sankirna nadai = 9M per Akshara

The tala can therefore be expressed by the following divisions of the akshara:

Fig. 3



A jathi can be expressed using different mathra durations known as *Kalapramanas* (Kala = 'tempo'). These are created by the expression of a jathi with additional pulses between each syllable called *karve.*

[235] Ibid. 164.
[236] Sankaran. *Drumming*. 25.
[237] Iyer. *Calculations*. 6.

Karve has two functions: 1) To indicate the duration of the components of a Jathi in terms of Mathras; for example 'Takatakita' has no karve and totals five mathras, whereas 'Ta.ka.ta.ki.ta.' has one karve and counts a total of ten mathras. 2) To be "used as an independent jathi to separate two jathis or groups of jathis"[238] The 'minim' value in figure 2 is a karve of the latter sort.

The main thrust of S Rajagopala Iyer's book is to indicate ways of mathematically calculating rhythmic cadences so as to reach the first beat of the tala or *Samam*, using basic concepts with wide capacities for improvisation. Rhythmic accentuation of the first beat of the tala is the most effective means of expressing the implicit structure of the composition. This is achieved by creating Jathi dissonance against the structure of the tala that resolves onto samam. The focus on the first beat is therefore not as a rhythmical starting point, but as a point of release or resolution. The aksharas of a composition are thus named in descending order. For example the eight Akshara cycle *Adi Tala* commences at 'eighth place.'

One of the fundamental first-order calculating devices in Iyer's text is the expression of 'Places' by repeating a corresponding jathis a number of times depending on the nadai. For example, the corresponding place of J3 is 3rd place. In chatusra nadai (4M duration) J3 can be said four times without karve, twice with one karve and once with three karves. These are known as the three speeds or *Trikala*. This is true for all jathi values; each can be said four times in chatusra nadai from their corresponding place. J7 x 4 from 7th place:

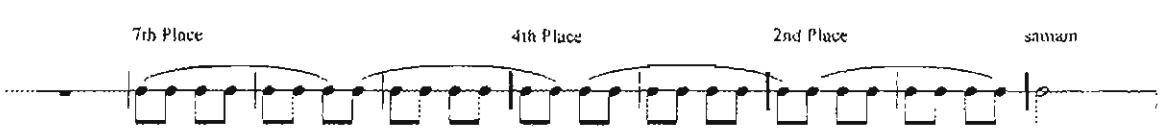


Fig. 4

[238] Ibid. 12

Alternatively, in tishra nadai (3M akshara division) a jathi can be said three times from its corresponding place, and in khanda nadai five times and so on.

Fig. 5: Adi Tala, Chatusra Nadai (4M), J5:

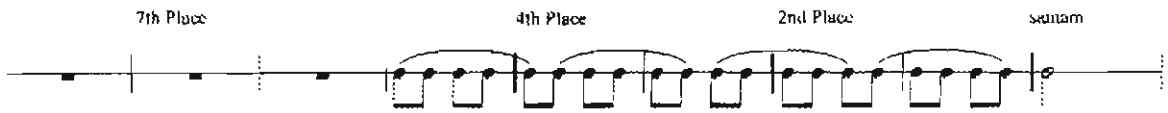
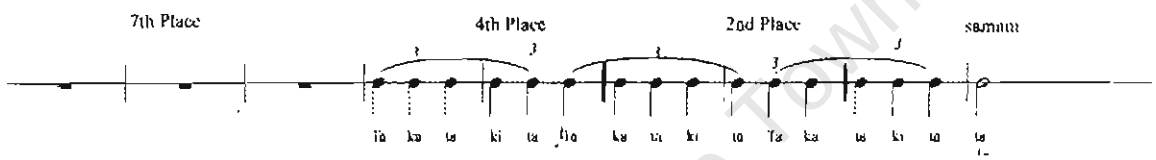


Fig. 6: Adi Tala, Tisra Nadai (3M), J5:



This rule provides a powerful means of calculating complex rhythmic phrases within a tala cycle and even, as will be shown later, in composite groups of tala cycles with the goal of reaching samam.

The meaning of the jathi within the total tala complex has a similar musical significance to the identities in Harry Partch's Monophonic fabric. The 1 Otonality is expressed by a group of identities in an arbitrary limit, namely 1:3:5:7:9:11. Similarly the basic expression of Chatusra Nadai within the tala is by the five jathis prescribing the rhythmic 9-limit (J9). These numbers are basic rhythmic units because they each create distinct rhythmic relationships against the tala. A jathi of four mathras will have the same significance against the tala as a jathi of eight, even though the amount of repetitions will change, the basic structural divisions created will be the same. Compare ten-mathra jathi (top voice) with a jathi of five mathras:

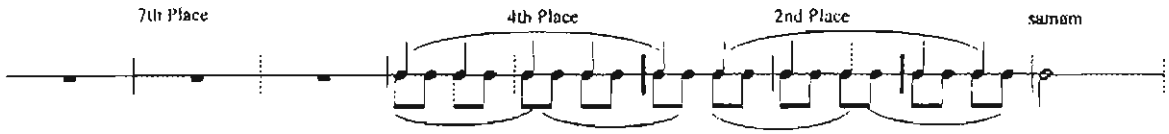


Fig .7

Because both jathi groups coincide on the third quarter of 5th Place, they are in a relationship of 1:2 and therefore divide the tala with the same measure of rhythmic dissonance. If two rhythms are in the consonant relationship of 1:2, their identities - in terms of the tala place – are similar. A rhythmic identity does not refer to a single jathi, but to a particular division of the tala, or as the expression from a particular place. The above example expresses five aksharas of the tala by quarter divisions (4 beats per bar) necessitating a jathi of five mathras. 5th place can be expressed once as 'T...' which will be one syllable per akshara, or twice and four times as above.

In terms of tala expression, both the jathi and the identity are accurate measures of consonance/dissonance or relative complexity. The most consonant expression of Chatusra Nadai is by a four-mathra jathi, four beats in a bar. This jathi is in perfect synchronisation with the inner divisions of the tala and will remain so in any of its 1:2 expressions; as 2, 8, 16 or 32 in a bar. One J4 = one akshara and eight of these jathis will express the complete tala

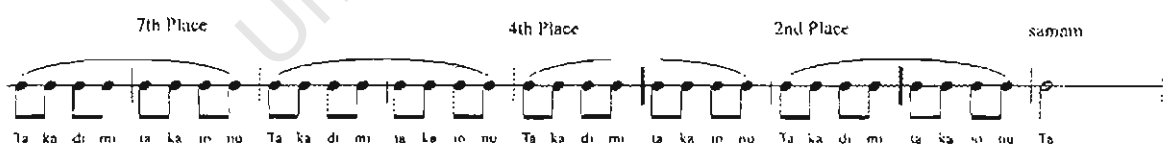


Fig. 8

J3 in the same nadai will, however, go against the inner divisions of the tala, without expressing its whole. This Jathi will express a particular period of the tala, i.e its 3rd Place as J3 x 4 in one-mathra kalapramana or J3 x 2 in four-mathra kalapramana.

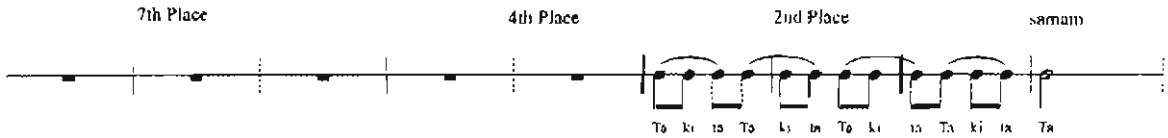


Fig. 9

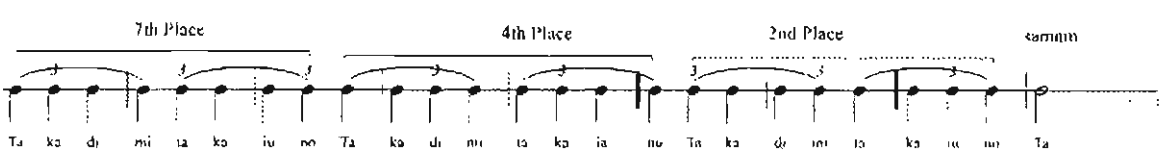
Because this only takes three Aksharas to 'resolve' – to reach a point of synchronisation with the tala aksharas - it is a of less rhythmic complexity than J7 in the same nadai, which is said from seventh place, thereby creating rhythmic dissonance over seven aksharas of the tala as illustrated in figure 4 above. One finds exactly the same measure of complexity and dissonance. Partch's 1 Otonality (see Addendum 1).

The re-interpretation of the fundamental tone in new identities (as positions of the chord other than root) remains paramount to the significance of Partch's pitch system as 'monophonic.' Unity has the potential to be interpreted in a variety of 'senses,' as the 1 identity of the 1 Otonality in its 1/1 form, the 3 identity of the 3 Otonality in 3/3 form and so on This corresponds to the *gathi bedam* of Carnatic percussion theory, translating literally as "gait (gathi) difference (bedam)" or pulse modulation. In mishra nadai, for example, the akshara is expressed by a triplet value or three Mathras:

// Tkt / Tkt / Tkt / Tkt / Tkt / Tkt / Tkt / Tkt //

'Tkt' is of three mathra duration or J3, and is therefore a three identity in jathi terms. The 1 identity or J4 is no longer consonant with the tala, yet still forms an expression of the complete cycle. As a rhythmic force alone it has greater stability than J3. The tala is now expressed with a J4 in mishra nadai, i.e. with a new pulse speed as J4 x 6 dividing the tala into three parts:

Fig. 10



This is true of all interpretations of the akshara. If the akshara is subdivided into seven, i.e. 1/1 (akshara) = 7/7 or mishra nadai and expressed by a 1 identity jathi (e'g' J8), it divides the akshara into seven parts as:

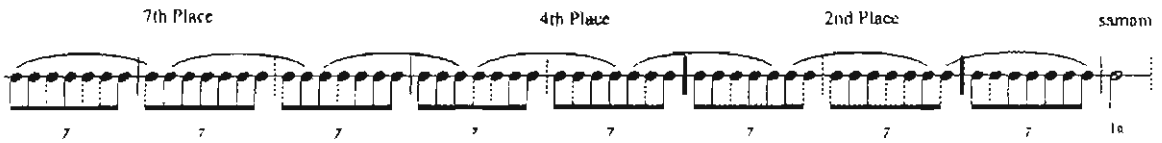


Fig. 11

The potentiality of the Akshara to be expressed in different jathi values by pulse modulation, as 1/1, 4/4, 3/3, 5/5, 7/7 and 9/9 - i.e. x number of mathras per akshara - is echoed by the potential of the jathis themselves to be expressed in different speeds, nadais or gathis ('Gaits'). The various expressions of J4 are 4/4, 4/3, 4/5, 4/7 or 4/9 in the 9-limit rhythmic system prescribed by Carnatic music. These are comparable to the roots of the Otonality chords in Monophony as described in Addendum 1.

The over number represents the jathi length and the 'under' number the divisions per akshara. 4/3 is therefore a four-jathi in tisra nadai (triplet speed) and it will divide the complete tala cycle into three parts as illustrated in figure 10.

This analogy allows the rules governing the relationships between musical tones to govern the relationships between jathi values, as well as the interrelations of the rhythmic possibilities provided by gathi bedam. All the relationships signified by the Monophonic ratios as derivations from unity, can also be used to express divisions of a tala cycle.
The structure of the tala is therefore completely expressed by ratios or proportions of the following levels:

1) the entire work
2) the cycle
3) the original pulse
4) a note duration

The thirty-five Tala structures according to Trichy Sankaran are as follows:[239]

Traditionally the symbols 'O' and 'U' are used as.

O = two beats or Drutam

U = one beat or Anadrutam

Numbers indicate the length of Laghu

Jathis	Anga Structure	Total Aksharas per cycle
Dhruva Tala		
Chatusra	4 O 4 4	14
Tisra	3 O 3 3	11
Misra	7 O 7 7	23
Khanda	5 O 5 5	17
Sankirna	9 O 9 9	29
Matya Tala		
Chatusra	4 O 4	10
Tisra	3 O 3	8
Misra	7 O 7	16
Khanda	5 O 5	12
Sankirna	9 O 9	20
Rupaka Tala		
Chatusra	O 4	6
Tisra	O 3	5
Misra	O 7	9
Khanda	O 5	7
Sankirna	O 9	11
Triputa Tala		
Chatusra	4 O O	8 (Adi Tala)
Tisra	3 O O	7
Misra	7 O O	11
Khanda	5 O O	9

[239] Sankaran, *Principles*, 38-39

Sankirna	9 O O	13
Jhampa Tala		
Chatusra	4 U O	7
Tisra	3 U O	6
Misra	7 U O	10
Khanda	5 U O	8
Sankirna	9 U O	12
Ata Tala		
Chatusra	4 4 O O	12
Tisra	3 3 O O	10
Misra	7 7 O O	18
Khanda	5 5 O O	14
Sankirna	9 9 O O	22
Eka Tala		
Chatusra	4	4
Tisra	3	3
Misra	7	7
Khanda	5	5
Sankirna	7	7

The following is a proportional analysis of a rhythmic cadence or Korvai with a smaller cadence ending called Ardi.[240]

Ta = half-note
Ta = quarter-note
Ta = eighth-note
/ = Eighth place or 'Samam.'

Adi Talam Korvai:

/. . tom ta ka ta ka ta re ki ta ta ka	8	
Ta dom ki ta ta ka ta ka ta re ki ta ta ka	8	20 (1/4 notes)
Ta lam ka dom	4	
tom ta ka ta ka ta re ki ta ta ka	8	
Ta dom ki ta ta ka / ta ka ta re ki ta ta ka	8	22
Ta lam ka Ta lam ka dom	6	
tom ta ka ta ka ta re ki ta ta k	8	
Ta dom ki ta ta ka ta ka ta re ki ta ta ka	8	24
Ta lam ka Ta lam ka Ta lam ka / dom .	8 (6+2)	
Ta ki ta Tom .	5	
Ta din gi na tom	5	
Ta ki ta Tom .	5	30
Ta din gi na tom	5	
Ta ki ta Tom .	5	
Ta din gi na tom	5	

[240] These were notated during the present writer's lessons with Ghatam (clay pot) player Umashanker, son of the renowned Vidwahn of ghatam, 'Vikku' Vinayakram in Madras, India during the year 2000.

Ardi

Tom . . ka num tom dom ka	8	
Ta di dom dom num tom dom ka	8	16
Ta lam ka dom ka tom .	6	16
Ta lam ka dom ka tom .	6	
Ta lam ka dom ka	4	

Taken as values of a complete tala cycle measured in quarter-notes (i.e. four beats per akshara) totaling 32 mathras the following proportions result, each representing increments of the avartanum:

20/32 - 5/8
22/32 - 11/16
24/32 - 3/4
30/32 - 15/16
32/32 - 1/1

One can see that 5/8 as an expression of a complete Adi tala cycle comprising 32 eighth-notes (four per akshara) will represent the value of 20 quarter-notes (20 of 32) Said alone this occurs from fifth place as in figure 7 above. Similarly, 3/4 represents twenty-four eighth-notes, which alone would be said from sixth place. Because of a common numerary nexus, these proportions all belong to a similar pulse or nadai, namely Chatusra.

Tala calculations provide a structural tool, providing the possibility of calculating rhythmic phrases in terms of a constant macro-structure, the Tala Avarthanum. In this sense Carnatic rhythmic composition is not in "Free Style," as it does not allow for an unlimited number of rhythmic possibilities, but only for phrases which function as expression of the given tala. Rhythmic composition therefore has a distinct and strict structural *telos*. The Tala Avarthanum, like harmonic centricity, provides a concretisation

of the hermeneutic circle or the dimly apprehended totality from which perception and understanding proceed.

The rhythmic dissonance and the inevitability of repetitive process and patterns combine to lead the ear (and mind) towards Samam (the first beat of the rhythmic cycle) and hence toward a presumed perception of the totality. This provides the possibility for the memory to restore "the chronological sense of totality – to cure the mnemonic plague."[241]

[241] Christopher Lewis. "Chronology." 135.

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